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BOSTON UNIVERSITY

GRADUATE SCHOOL

Thesis

FACTORS CONTROLLING THE GEOGRAPHIC DISTRIBUTION OF THE LEADING AGRICULTURAL CROPS OF THE WORLD

Submitted by

Wendell Frederick Smith

(B.S., Massachusetts Agricultural College, 1919)

In partial fulfilment of requirements for

the degree of Master of Arts

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INTRODUCTION

One of the few powers which the federal government of the United States and the respective states of the union have in common, is the encouragement of agriculture. Agriculture, rather than any other type of production, establishes the foundation of every country in the world. The farm problem was an important consideration in the political campaign of 1928 in the United States, and is equally vital in many countries of Europe. Wherever people live and are interested in their community, agriculture and its products are in the foreground of the thought of men.

We need the fruits of the orchard and the products of the soil, for man is dependent upon vegetation for his existence. Yet the majority of people know little of the requirements for the growth of these agricultural products, and cannot appreciate the scope of their possibilities. The most important requisites to be considered are climate, physical features, soil, and the farmer himself with his necessary equipment, not only on the farm but in the community as well. To successfully manage the farm with all its accessories and adjuncts requires a thorough knowledge of soil, the needs of plants, and the value and application of the most efficient methods.

God has given us powerful forces over which man has no control, but forces which make it possible for us to live. These forces are rain, sunshine and air, which are essential to vegetable life, and each one of which is dependent upon the other. Without rain there could be no

vegetation; without sunshine or air, nothing could grow. These factors are commonly referred to as "weather" which denotes daily changes in wind, temperature and rain; or "climate" which is the average of these weather conditions. For example, certain sections of the world are rainy, though this does not mean that it rains there all of the time, but that rain is the average condition for that particular locality. We have great variety in climates: dry, hot, desert climates; rainy climates; variable climates, as in most of the United States; frigid climates; etc.

Even though man can adapt himself to all extremities of temperature, vegetation cannot do this thing, so temperature becomes an important factor in the growth of agricultural products. The cotton plant is perennial if planted where it is warm enough, but it is also grown in a zone of temperature where there is frost which may kill it. The tea plant, on the other hand, will grow with success when exposed to 20 F. Where frost occurs, it is generally important to consider its effect upon vegetation, and in the United States the dates of the latest killing frosts in the spring, and the first killing frosts in the fall, have been found by the averages of long years of collection of data, enabling the farmer to tell when to plant his products, and when his crops are in danger of being killed by frosts in the fall according to his location. The coming of the first snow-fall should be known by those districts that depend upon snow for protection. When winter wheat is sown, it needs the protection of the early snow before the first severe frost comes, for

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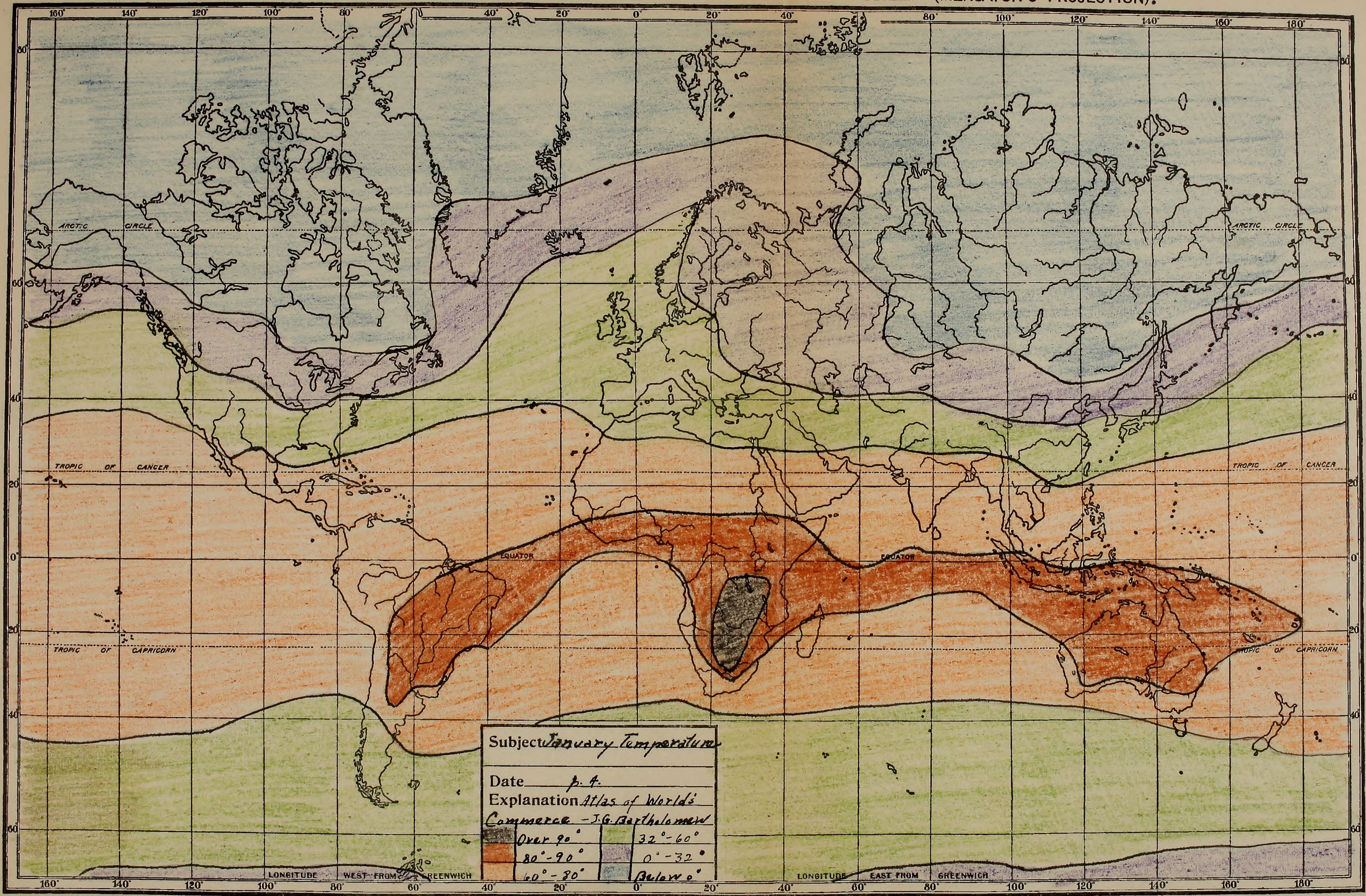

Subject January Temperature

Date p. 4.

Explanation Atlas of World's Commerce - J.G. Bartholomew

Fig. 1

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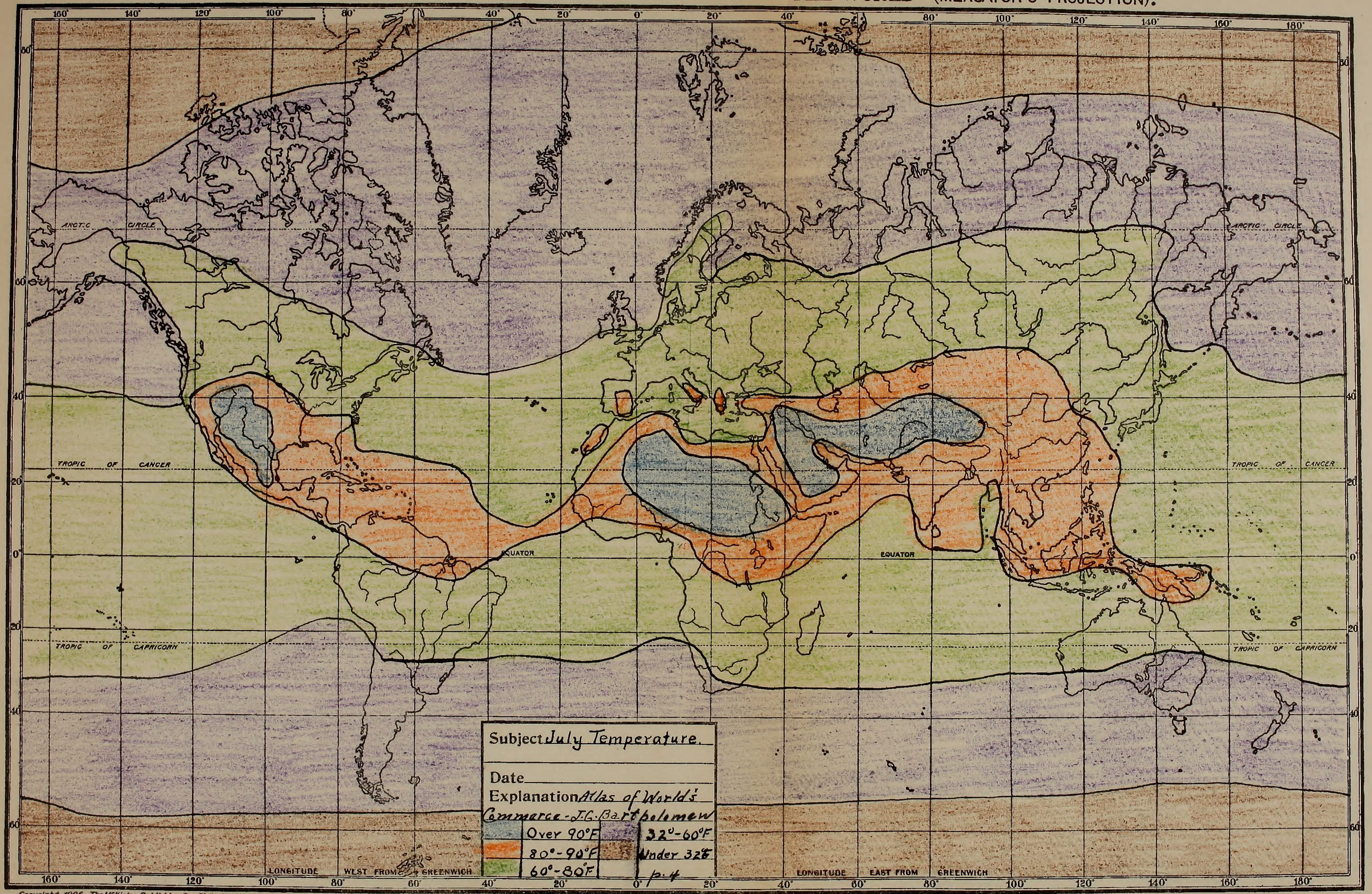

Subject July Temperature.

Date

Explanation Atlas of World's Commerce - J.G. Bartholomew

🟦	Over 90°F	🟪	32°-60°F
🟧	80°-90°F	🟫	Under 32°F
🟩	60°-80°F		p.4

Fig. 2

if the frost comes first, the seed of the winter wheat is killed. Hail and thunder storms are severe in some sections of the world and do much damage to vegetation. Rainfall is important too, because sometimes we have rain in such abundance that it runs off the surface and does little good to vegetation, while at other times it comes so infrequently that no vegetation will grow from lack of moisture in the soil. Again, some crops require a large amount of rain; others a moderate amount; and there are still others that can get along with little rain each year. Since heat seems to be the most important factor of those noted under the head of climate, I will discuss that first.

If we examine the maps showing the temperature of the world in summer and winter, it will be noticed that the warm areas are near the equator, with the cold areas increasing as one goes toward the poles. On a globe, the divisions of the five zones are drawn by following parallels of latitude, although in actuality the boundaries are by no means so regular. It must be realized that there are some parts of the torrid zone which are just as cold as parts of the frigid zones; also that the heat of the torrid zone is found in some parts of the temperate zones.

The explanation of this variation in the temperature of the earth is due in general to the changes in the position of the sun in relation to the earth, the tilting of the earth on its axis, and the altitude of the place under discussion. This item of altitude needs some explanation. The direct rays of the sun in the zenith are the warmest rays, yet these are limited somewhat by the faint cloud of dust which surrounds

the earth. The heat of the sun is lessened as it comes to the earth at an angle, because it comes through a thicker haze of dust-ladened air, and fewer rays reach a given area, as they are spread over a larger part of the earth's surface than when the sun was overhead in the zenith.

This will perhaps explain the daily and seasonal temperature-changes of the earth. The amount of daily range varies from time to time, and from place to place, and it is different in the temperate latitudes from what it is in the tropics, and also different on the land from what it is on the sea. So, also, is there a variation in the seasonal range of temperature throughout the year, from one place to another.

It is known that land cools faster than water, and that land is warmed faster than water. Since this true, the water has an important effect upon the temperature of the adjoining land. For example, it is desirable to plant an orchard near a lake which would tend to ward off early frosts in the fall, giving a longer growing season. It must be remembered that any influence which the water may give to the land cannot be given without the aid of prevailing winds blowing over the water toward the land, thus making the land warmer, whenever the water is the warmer of the two.

In the ocean we have many examples of both warm and cold currents which influence the adjoining continents correspondingly. We have the Gulf Stream which flows in a northeasterly direction from the Gulf of Mexico toward Europe, giving a mild climate to the British Isles, and in contrast there is the Labrador stream, a cold current, which somewhat chills the coast of Labrador, extending as far south as Cape Cod. Another

important influence of the currents is their effect upon rainfall, which will be spoken of a little later.

Mountains have considerable influence in many parts of the world in acting as a barrier to the warm or cold winds blowing over the land. This permits smaller areas of land to have varied temperatures, according to their protection from winds, their altitude, and their latitude.

Altitude must be taken into account as an important influence in causing a change in land temperature. The sun is constantly radiating its energy which passes through the almost perfect diathermanous air and heats the earth. Some of the objects of the earth, such as water and light-colored substances, reflect this heat, while dark objects absorb it. Heat is always radiating out from the earth, although some objects, like water, are poor radiators and give off less heat than others. This warm air, rising from the earth's surface, expands and cools as it rises. The higher one travels in an aeroplane, the cooler it becomes, because the warmth from the earth does not penetrate the upper layers of the atmosphere. Highlands may be exposed to the direct rays of the sun becoming very warm during the middle of the day, but as soon as the sun is set they radiate their absorbed heat rapidly into the clear, thin air, and as rapidly cool off. A drop from 60 to 80 F. is not uncommon between day and night, because of this radiation of heat. Taking into consideration the fact that the temperature decreases as the altitude increases, it is possible to raise crops indigenous to other zones in the torrid zone, by cultivating the hillsides at those altitudes suited to the requirements of

each crop. Starting in the valleys, there is tropical vegetation; higher in the mountains, vegetation of the temperate zone; and toward the top of the mountains, vegetation of the frigid zone is found. The Incas in Peru did their farming in much this way. In Central America they have temperate-zone conditions in the high interior. Considering the altitude from sea level to about three-thousand feet, called the Tierra Calienta, they have a temperature of 75-83 F. and raise tropical fruits there.(1) In a belt of three-thousand to six-thousand feet, called the Tierra Templada, there is a temperature of 65-75 F., and this is the coffee belt of Central America. With an altitude of six-thousand to ten-thousand feet, called the Tierra Fria, there is a temperature of 54-65 F., and a belt of temperate-zone products. Most of the cities are within this particular range of altitude, while at still higher altitudes of from ten-thousand to thirteen-thousand feet, is found waste,barren land just below the snow-line, called the Paramos. This illustrates the important influence of altitude upon vegetation in various parts of the world.

Not only the conditions for crop growth but the salubrity of mankind, and especially that of the white race, should be considered, for some parts of the world are more healthful than others. In the equatorial zone, which is that zone lying approximately at the equator, we have a region of

(1) Lecture notes of Professor Martin.

rain-forests, a section having two rainy seasons and two relatively dry seasons, and not being entirely without rain in the dry seasons. Here we have the highest rainfall of any climatic zone, averaging between eighty and one-hundred inches of rainfall per year, and as a result of its high heat, it has a long growing season, being most favorable for forest production. Despite its advantages, the white man finds it difficult to improve and progress under these conditions, for although the temperature is not as high as in some other zones, it is a continuously high temperature, accentuated by high humidity, and causes great discomfort. The temperature and the humidity are very uniform, making it difficult for man to endure the climate. No progress is made in this zone in general, although the Dutch have succeeded to some extent in the Malay Islands. The natives are at a low level; disease is prevalent; and this is considered the most unhealthful zone in the world for man. The tsetse fly causes sleeping sickness in parts of this region, and types of fevers and malarias are common, while it is said that the white man will lose his efficiency and ambition if he lives under these conditions for only a very few years. Although this zone of rain-forests has large and abundant vegetation, whatever may come from it for the use of the world at large, must come almost entirely as a result of native effort and development, as is done in the East Indies in the production of rubber.

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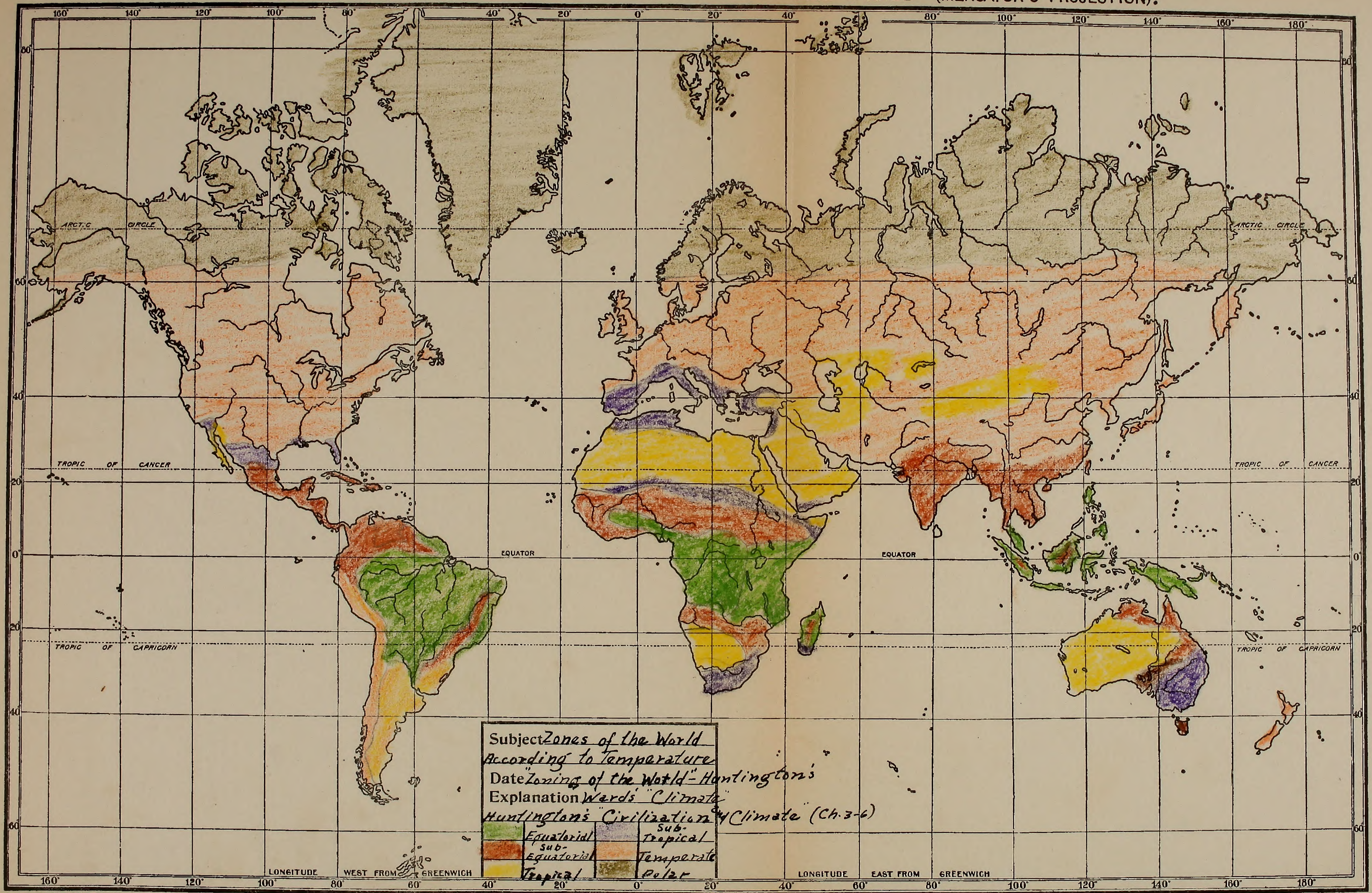

Subject Zones of the World According to Temperature

Date "Zoning of the World" - Huntington's

Explanation Wards' "Climate" Huntington's "Civilization and Climate" (Ch. 3-6)

🟩	Equatorial	🟪	Sub-Tropical
🟥	Sub-Equatorial	🟧	Temperate
🟨	Tropical	🟫	Polar

Fig. 3

Other zones of the world are more favorable to the life of men, with exceptions, of course. We have our deserts where few people live, and our frigid areas of the North and South, but the rain-forest of the world is the most unhealthful region for mankind. In explaining the zones of temperature, the salubrity of a region may be more easily understood.

The three regular climatic zones familiar to most school boys, determined by a temperature basis, are the torrid, temperate, and frigid zones. The torrid zone is bounded by the 68 F. isotherms (mean temperature). The frigid zones are bounded by the mean isotherms of 32 F., and below this temperature men do not develop. The temperate zones lie between these two isotherms -- 32 F. and 68 F.

In discussing the divisions of the three zones just mentioned, we have the following classifications: Equatorial zone, sub-equatorial zone, intermediate zone, desert zone, sub-tropical zone, temperate zone, and polar zone.(1) The equatorial zone, or zone of rain-forests, has already been described. Considering the zones in order, starting at the equator, and going north or south, the sub-equatorial zone comes first. This is a zone of tropical jungles, having one long wet season, and one long dry season, with practically no rain during the dry season. Here the conditions are favorable for vegetation although it is not as favorable for trees as the equatorial region. Undergrowth develops rapidly to tree size, because the tree development is not enough to shade the underlying ground, while the types of vegetation include a variety of fruit trees

(1) Huntington's Classification, explained in Ward's "Climate". & Huntington's Civilization and Climate, chapters 3-6.

such as the banana, bread-fruit, etc., and bamboo grows luxuriantly. The temperature is variable having winters which are cool, and summers which are hot with cool nights, -- a temperature that man can endure because it is not uniform, and as a result the people are of a higher scale than those of the rain-forests. Countries included in this region are Columbia, Central America, parts of Africa, parts of the East Indies, India and Burma.

The intermediate zone is the region of tropical grasslands or desert edgelands, having a rainy season that is shorter, and a longer dry season, which result in the development of grass some of which grows to a height of fifteen to twenty feet at times. Examples of this grassland area are found the world over and include the Savannahs of Africa and Australia, and the Llanoes of Venezuela. Much of the land is used for cattle-raising, and the Sahara edges is of this type.

The next zone in order is the tropical or desert zone with a range of 20 - 30 north and south latitude. The greatest development is found in the Sahara, Arabia and northern India, southern and lower California, the Australian desert, and the region east of the Andes in South America. The highest temperatures in the world occur in the deserts in the daytime (official temperatures in the United States have reached as high as 120 F., and in the Sahara 150 F.) and the rainfall is less than ten inches a year. There is a wide range of temperature, from 60 to 70 for every twenty-four hours in a day, because heat is lost rapidly at night. In addition to the limited rainfall, wells, springs, and a few rivers supply water. Even though Egypt is in the midst

of a great desert, it is one of the important agricultural countries of the world, and with very fertile soil, it requires but moisture and labor to produce the cotton and wheat which it grows for a world market. There is a plan already proposed to irrigate part of the west Sahara desert, and to transform what is now the barren sand into a second Garden of Eden.

The sub-tropical zone is located on either side of the tropical zone, and is north of the desert zone in the north-temperate zone. A winter rainy season and a summer dry season, just the opposite condition to the sub-equatorial zone, occur here, and certain forms of fruit such as the olive, the grape, the mulberry, citrous fruits, etc., are grown, although irrigation seems essential for extensive agriculture. Regions of the world included are Southern California, Asia Minor, Northern Africa, Southern France, Spain and Italy.

The temperate zones have a more uniform distribution of rainfall, varying from possibly ten to one-hundred inches in certain localities, and the weather conditions, varying from the hot summer season to the cold season, have made this zone the home of most of the important agricultural products of the world.

Polar zones are fairly uniform, and have a light rain or snow-fall averaging less than ten inches a year. "Tundras" is the common name given to these polar deserts, located generally north of 70 north latitude, although they may vary according to local conditions. There is a short summer season

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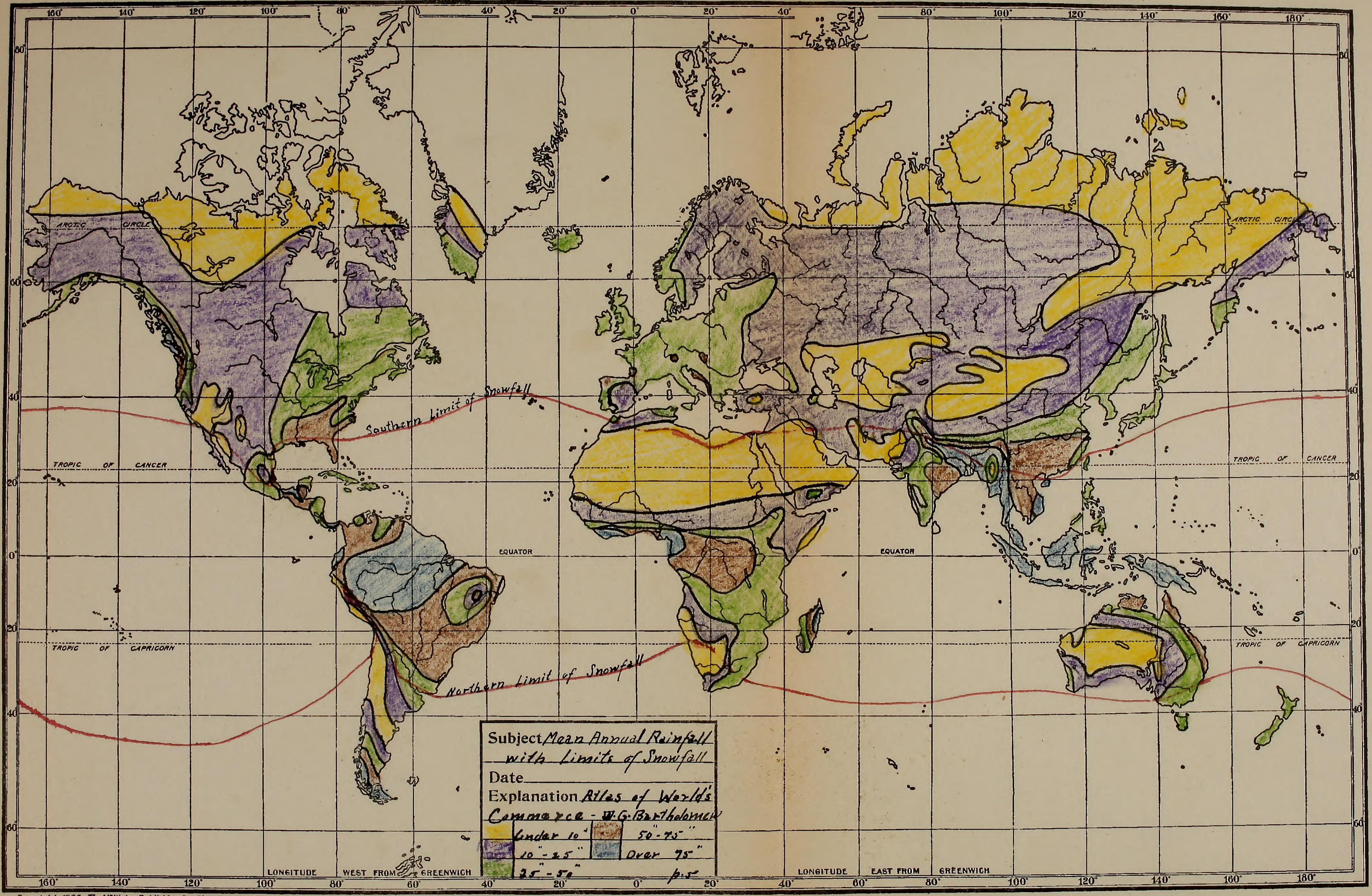

Subject *Mean Annual Rainfall with Limits of Snowfall*

Date

Explanation *Atlas of World's Commerce - W. G. Bartholomew*

🟨 *Under 10"*
🟪 *10" - 25"*
🟩 *25" - 50"*
🟫 *50" - 75"*
🟦 *Over 75"*

p. 5

Fig. 4

with some vegetation, and because of the long days, some of the temperate-zone crops can be grown in Alaska, but in general the use of the polar desert is limited.

The next important climatic consideration, besides temperature, is rainfall. From the previous discussion it will be seen that many zones have their wet and dry seasons which influence the nature of the vegetation in the respective zones, and the quantity of precipitation has its effect upon vegetative growth also. Rainfall itself is caused by the evaporation and condensation of water-vapor. Particles of water are absorbed by the air from large bodies of water at warm temperatures, and since warm air rises, this water-vapor is carried higher into the air where it condenses somewhat upon cooling in the form of clouds. When they have reached a point of saturation for a certain temperature, further cooling then forces some of the vapor to condense to liquid water, or, if the temperature is below 32 F., to snow or ice, which is known as precipitation.

In the temperate zones we have a system of cyclones and anti-cyclones, the former being a low-pressure wind system, the latter a high-pressure system. The wind generally blows from a high to a low pressure, bringing about some sort of precipitation in and about the low barometric or cyclonic area, and since the prevailing winds in the temperate zones are westerly, storms usually travel in that general.

Marine currents indirectly influence rainfall on the adjoining land, for winds, blowing over warm ocean currents to cooler adjoining land, bring rainfall, increasing the precipitation at certain points considerably above normal. For

example, parts of the western coast of the United States are so influenced. In contrast, a cold current gives the opposite effect, as is noted when a cold current off the coast of northern Africa produces the Desert of Sahara, because the northeasterly winds, blowing off the land to the colder sea, cause increased saturation of air with water, and condensation in the sea. The Humboldt current affects the aridity of the western coast of South America. Thus we have touched upon the explanation of the distribution of world rainfall, whether it is influenced by cyclonic action as in the temperate zone, or by evaporation and condensation as in the torrid zone, or by the influence of currents in many parts of the world.

In examining the map of the world showing the distribution of rainfall, it will be noticed that only a small part of the earth's surface that is habitable, has less than ten inches of rainfall each year. For the most part those regions which are at the present time producing the world's supply of food, and which contain the more populated districts, have from ten to approximately one-hundred inches of rainfall each year, and parts of Europe and the United States, which are prominently agricultural, average from twenty-five to fifty inches. Some of the regions having the greatest amount of rainfall are as follows: Parts of the west coast of North America; the Amazon Valley of South America; an area about the mouth of the Niger river in Africa; parts of India; Southern China; the Malay Peninsula in Asia; and the East Indies. Some of the

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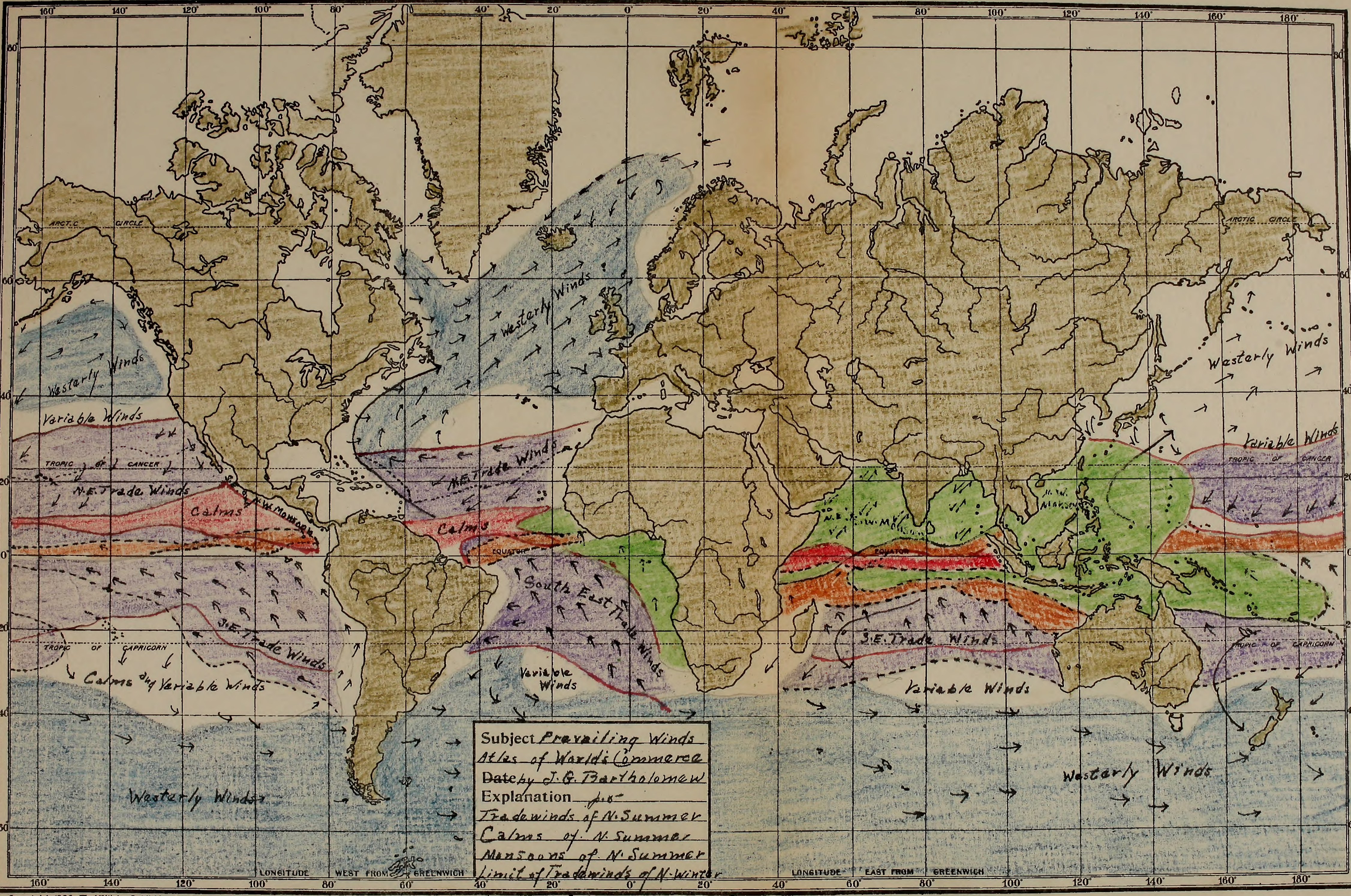


Subject *Prevailing Winds*
Atlas of World's Commerce
~~Date~~ *by J. G. Bartholomew*
Explanation *p. 5*
Tradewinds of N. Summer
Calms of N. Summer
Monsoons of N. Summer
Limit of Tradewinds of N. Winter
Limit of Calms of N. Winter
Limit of Monsoons of N. Winter

Fig. 5

irrigated regions of the world, such as the valley of the Nile in Egypt, and Southern California, have a rainfall of less than ten inches in a year.

As has already been noted, different sections of the world have different times for their rainy season. The reason for the abundance and deficiency of rainfall in the different parts of the world, can be explained in a general way: Mountains, hills and valleys have an effect of a local nature upon climate. Mountains may shut off winds, as the Rocky mountains do in the United States, preventing the rain-ladened winds from carrying water to the plains beyond, while in Italy and southern Spain the Alps shut off the cold winds from the north, and this, in conjunction with the warm waters of the Mediterranean, produces a climate such that oranges and palms may grow there in a latitude of the cities of Boston and New York, though these are visited by killing frosts several months of the year.

In the so-called equatorial Belt of Calms, the verticle position of the sun causes the climate to be hot, and the rainfall is abundant because of the rapid rising of air which quickly reaches an elevation so that it condenses. Here the northeast and southwest trade winds meet approximately at the equator, and as these winds blow from the water to the land, they naturally carry water-vapor in them. From the north and south of the Belt of Calms, the trade winds blow toward warmer regions, with the result that water-vapor is constantly evaporation into the air, the quantity depending

upon the warmth of the air. When the wind blows over the land where the air rises and cools, the vapor is condenses and precipitation occurs, so that those coasts which face east, against which the trade winds blow, are very rainy. Examples of this are the east coast of South America, both the East and West Indies, and southeast Africa.

The trade winds also influence the aridity of certain areas of the earth. As they blow over the land they take up the water-vapor, and since there is so little moisture available, these winds become very dry, and into these any water-vapor to be had, rises. As a result, very little moisture is left for vegetation, and by examining a map of the world, it will be seen that there is a belt of deserts including parts of Australia, southwestern United States, and southwestern South America. The map of prevailing winds clearly explains the various winds that are described here.

In the temperate zones the rainfall is carried by the prevailing westerly winds. Rainfall decreases as one goes to the north and to the wouth of the temperate zone, because there is less water-vapor to the north in cold air than in warm air, and because of the natural arid regions to the south. There is often a variation in rainfall in the temperare zone from the west coast toward the east coast. In the northwestern United States we have the heaviest rainfall in this country, amounting to about one-hundred inches per year, and there the westerlies carry the damp air from the ocean up the

mountain slopes where it cools, and consequently in the winter there is an almost constant rain, or fog, or drizzle, daily. The same thing is true of southwest Chili, but there the mountains running north and south act as a great barrier. So much of this damp-ladened air is condensed as it rises over the high mountains, that the eastern slopes have very little, or no rainfall, coming from the almost-dry air that is descending the mountain sides. The Sierra Nevada and the Cascade mountains act as effective barriers in this respect in North America.

The interior of continents, if they are at some distance from the sea, receives much less rainfall than the coasts. Frequent periods of drought occur in the central part of the United States. Rain from the Gulf of Mexico, and from the Southwest or Northwest, brings what moisture there is to these interior lands.

The Monsoon climate of southeastern Asia is very influential in the agriculture of that region. This type of climate is especially developed in India, although it is well pronounced in southern China, and in southern Japan. During the summer in the northern hemisphere, the southeastern part of Asia is heated by the sun. Air expands and rises because of the heat, and produces a cyclonic or low-pressure area in that region. Air currents, from the high-pressure areas over the sea, rush into this low-pressure area. These winds laden with moisture, blow over the lands to the high mountains where they are cooled, and abundant rainfall follows. This is what is known as the three-month period of the summer Monsoon. Highly desirable conditions for agriculture are thus furnished.

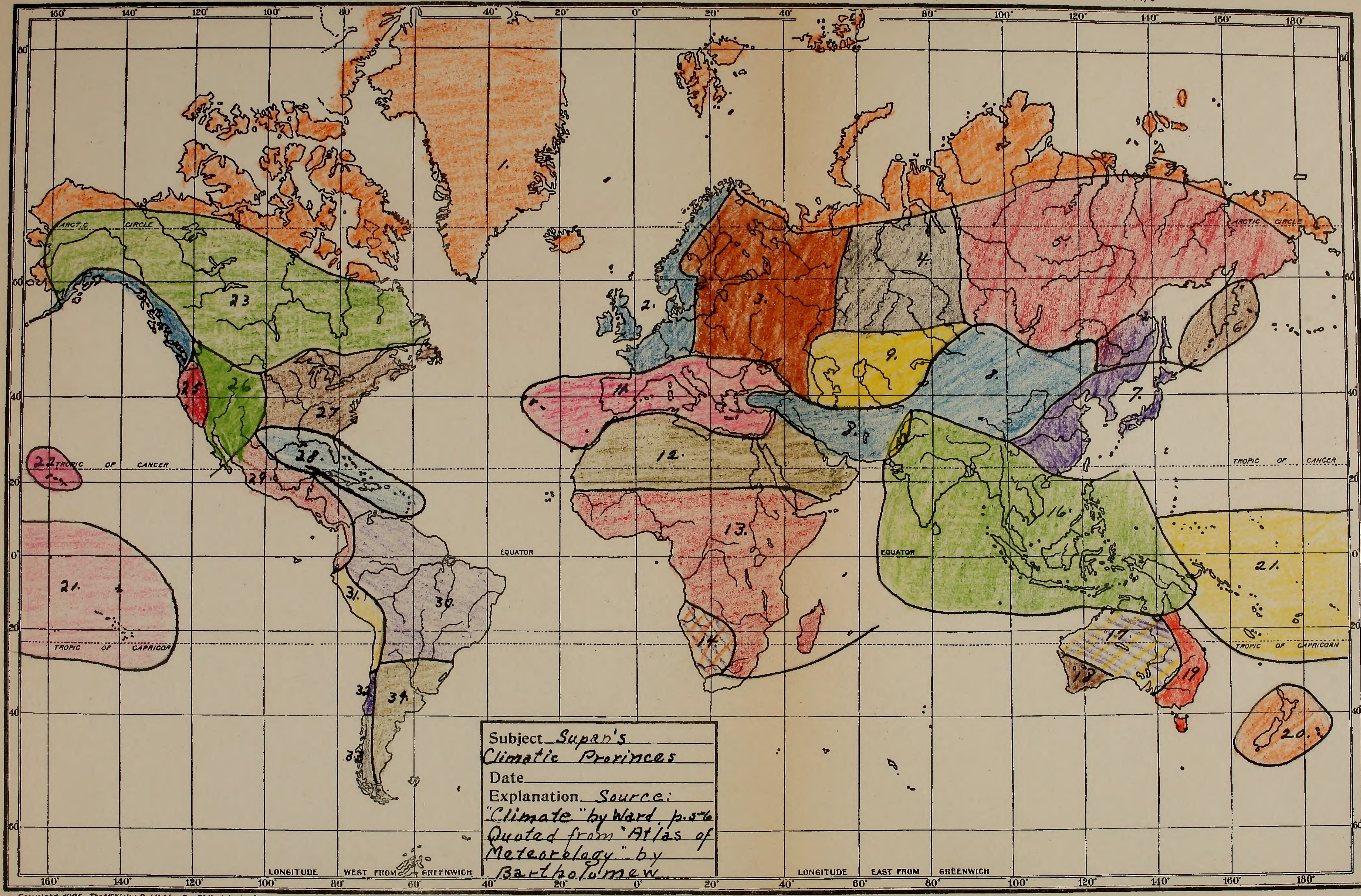
It is under these conditions that the great populations of the world live.

Then as soon as the sun moves to the south of the Equator, this land-area begins to cool, and the air currents, which during the summer Monsoon had blown toward the land, now blow away from it toward the sea. This period of three months is known as the winter Monsoon, and since the winds are blowing from the land, there is very little precipitation at this time.

At this point, it is desirable to present a classification of the climates of the world, something in which the geographical factor plays an important part. This classification should select regions on the earth's surface which have similar characteristics of temperature and rainfall, and winds that are found in areas having common topographic conditions. It is difficult to divide the world into a small enough number of provinces, and yet make a complete list which would not bear some modification. Various systems have been devised. Supan, Köppen, Ravenstein, Herbertson and others have devised climatic classifications of one sort or another. Of these, probably that of Supan is the best known. Supan's system gives a fairly simple and satisfactory grouping, with a tendency toward system and ability of comparison. He emphasizes the essentials of each climate.

Köppen's scheme subdivides the climates, especially emphasizing the botanical side. He brings out the coördination

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject *Supan's Climatic Provinces*

Date

Explanation *Source: "Climate" by Ward, p. 56 Quoted from "Atlas of Meteorology" by Bartholomew*

Fig. 6

of districts of vegetation, and of climate, and also recognizes the differences of the climate on the eastern and western coasts of continents, as distinguished from that of the interior.

Ravenstein's hygro-thermal plan is based upon rather unsatisfactory data. In his grouping, regions which have entirely differnet climatic conditions, other than temperature, are grouped together because they have the same mean annual temperature and relative humidity.

Herbertson groups natural geographic regions in a less complete way than Supan. He has attempted to group climatic regions which have similar temperatures, rainfall and configuration.

The following is the classification according to Supan, which may be followed on the map entitled, "Supan's Climatic Provinces": (1)

1 -- Arctic Province
2 -- West European Province
3 -- East European Province
4 -- West Siberian Province
5 -- East Siberian Province
6 -- Kamchatkan Province
7 -- Sino-Japanese Province
8 -- Asiatic Mountain and Plateau Province
9 -- Aral Province
10 -- Indus Province
11 -- Mediterranean Province
12 -- Saharan Province

(1) Ward's "Climate", quoted from Atlas of Meterology by Bartholomew, p-56.

13 -- Tropical African Province

14 -- Kalahari Province

15 -- Cape Rrovince

16 -- Indo-Australian Monsoon Province

17 -- Inner-Australian Province

18 -- S.W. Australian Province

19 -- East Australian Province

20 -- New Zealand Province

21 -- Tropical Polynesian Province

22 -- Hawaiian Province

23 -- Hudson (N. Canadian) Province

24 -- N.W. American Coastal Province

25 -- Californian Province

26 -- North American Mountain and Plateau Province

27 -- Atlantic (East North American) Province

28 -- West Indian Province

29 -- Tropical Codilleran Province

30 -- South American Tropical Province

31 -- Peruvian Province

32 -- North Chilean Province

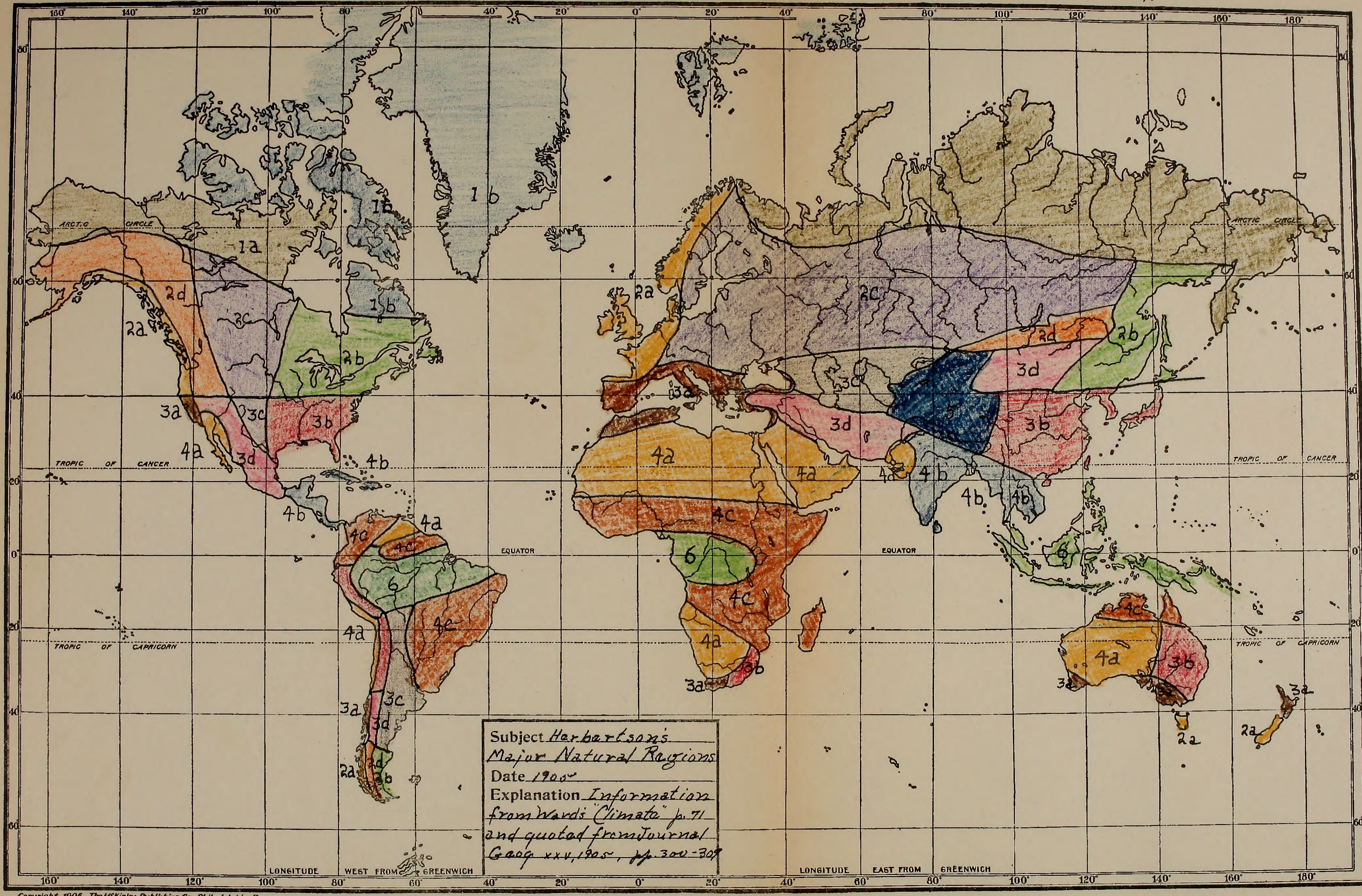
33 -- South Chilean Province

34 -- Pampa Province

35 -- Antarctic Province

Herbertson's major natural regions bring about a certain unity of temperature, rainfall seasons, configuration, and vegetation in the various provinces. These regions are chiefly controlled by continental and marine influences, and each one has generally similar relations to human life, plants and animals.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject *Herbertson's Major Natural Regions*

Date *1905*

Explanation *Information from Ward's "Climate" p. 71 and quoted from Journal Geog xxv, 1905, pp. 300-309*

Fig. 7

The map shows his natural geographical regions divided into six general groups, of which there are a few subdivisions indicated as follows:(1)

1. POLAR
    - (a) Lowlands (Tundra Type)
    - (b) Highlands (Ice Cap Type)
2. THE COOL TEMPERATE REGIONS
    - (a) Western Margin (Western European Type)
    - (b) Eastern Margin (Quebec Type)
    - (c) Interior Lowlands (Siberian Type)
    - (d) Interior Mountain Area (Altai Type)
3. THE WARM TEMPERATE REGIONS
    - (a) Western Margin with Winter Rains (Mediterranean Type)
    - (b) Eastern Margin with Summer Rains (China Type)
    - (c) Interior Lowlands (Turan Type)
    - (d) Plateau (Iran Type)
4. TROPICAL REGIONS
    - (a) The West Tropical Desert (Sahara Type)
    - (b) East Tropical Lands (Monsoon Type)
    - (c) Inter-Tropical Table Lands (Sudan Type)
5. LOFTY TROPICAL or SUB-TROPICAL MOUNTAINS (Tibetan Type)

Thus far we have dealt largely with climate as an influencing factor and requisite for the growth of agricultural products. Now we shall consider topography and soil, and see how the physical elements exert a definite influence upon the growth of vegetation.

(1) Ward's "Climate", p-71, quoted from Journal of Geography, Vol. 25, 1905, pp 300-309.

Topography involves the lay of the land. In a broad view of the earth's surface, the continents differ in their distribution of mountains and plains. In general the mountain systems of the old world, in the northern hemisphere, run east and west; in the new world they tend toward a northerly to southerly direction. In northern South America the highlands are more or less parallel to the coast which leaves a large section of low plains in the interior, sloping gently from west to east. In Africa the continent is composed of high plains in the interior, with lowlands bordering the coast. We have the broad agricultural region in North America, located in the central part of the continent, lying between two mountain systems. In Europe and Asia there are lowlands along the coast, which in Europe extend well into the interior, while in Asia we have broad areas of plateau land in the interior of the continent, though in other sections, as in India, the low plateau is seen which is valuable for agriculture.

I have already discussed the influence which altitude has upon vegetation, showing how the height of the land above sea-level determines, to a considerable extent, the crop that may be grown in a certain location. It was also said that certain slopes of certain mountains have more rainfall than other slopes. Also, it is true that slopes with a southern

exposure in the northern hemisphere, and a northern exposure in the southern hemisphere, will produce earlier crops in the season, due to the relative positions of the sun and earth.

Besides altitude, or height above sea-level, and its effect upon vegetation, there is the effect of the valleys upon their crops. The heights round about the valley may be snow-capped, while down below, the fields are green and bountifully productive, because of their protection from the cold blasts by the shelter round about them. Add to this the heat of the sun, which is attracted by the dark color of the valley-soil, rather than by the whiteness of the snow, and the streams resulting from the melting snow, and the valley blooms in all its glory.

Bodies of water, chiefly lakes and rivers, influence the character of the crops which are grown along their shores and banks. It is a known fact that water warms less quickly than land, as it takes approximately twice as much heat to raise the temperature of a pound of water one degree, as an equal weight of rock. Therefore, a small body of water warms more slowly during the day than the adjoining land, and during the winter, and at night, being a poor radiator, it cools more slowly than the land, so we have a less extreme range of temperature over the water than over the land. This brings about a climate which is equable near large bodies of water,

Facilities for communication and transportation are

influential in developing important agricultural regions. It is said that the rich, black soil of the Argentine was practically worthless before the coming of the railroad, when some of the land owners became millionaires almost over night, because of the increase in land values. These facilities of transportation and communication depend, partly at least, upon the topography of the land, for this determines the routes which railroads and water transportation follow, covering the distance between the hinterland and its point of distribution. A section which is isolated from the rest of the world by natural barriers, has difficulty in disposing of products in excess of its own consumption. Natural harbors are desirable, but are not as important as the hinterland which is supplying the commodity to the seaport.

The character of the soil, as well as the topography of the land, influences the type of crops which can be grown on it. As is well known, the three general kinds of soil, graded according to texture, are sand, loam, and clay. Of these the sand is the coarsest, the clay the finest, and the silt or loam is of medium texture. There are other grades of soil, such as gravel, coarse sand, etc., but the three above mentioned are the common grades according to texture. According to chemical composition, there are many, many soil compounds which contain desirable plant foods. Some have the plant foods in available form for plant use; others do not. Of all the

elements which are known in the world to-day, there are ten which have been found to be essential for plant growth. These are as follows: oxygen, hydrogen, nitrogen, potassium, sulphur, magnesium, calcium, iron, phosphorus, and carbon.(1) It has been found by experimentation with different plants that each one of these elements is necessary to get the best results in growth. If one or more of these ten elements are taken from the soil, the plant growth is weakened to a certain extent. Certain crops require larger percentages of plant-food elements than others. For example, it has been found that potatoes, and other crops of a bulbous or tuberous nature, demand a considerable amount of potash which contains the element potassium. Other plants, because of deficiency of nitrogen in the soil, due to its loss by solubility and the demands of plants, require a considerable amount of nitrogen to be added by artificial or natural means. For example, plants which require a woody growth or stimulation, find nitrogen the substance desired. Of these ten elements, three have been found necessary to plant growth -- nitrogen, potassium, and phosphorus. The others are essential to a less degree, but are usually quite plentiful in the soil.

Some plants do better in sandy soil; others in loamy; others in heavy soil. Corn flourishes in a well drained, rich, sandy loam, while wheat does best in a rich, black, clay loam; rice needs a light, moist soil with a clay sub-soil which holds

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(1) Soils, Their Properties and Management by Lyon, Fippin and Buckman --p-4.

the moisture at the surface for the crop to grow in. Therefore, crops vary in their soil requirements, as may be observed from the chart following.

After the desirable soil conditions, and other essential requirements for the growth of a crop are met, the question of suitable equipment arises. If a man is in the truck-farming business, he will require all sorts of plows, possibly a tractor or two, as well as sufficient hand-tools, and packing equipment necessary for the disposal of his crop. The apple business requires plows, harrows, spray-equipment, ladders, baskets and boxes for packing, etc. A man raising wheat will need large tractors, harvesters, and threshing machines, and possibly a local grain elevator in which he may store his grain until it is sold, or shipped to another market. Thus we might name each crop and the particular type of equipment that is needed to grow it most economically and successfully.

Labor itself is another important consideration in successful agriculture. At the present time in the United States, because of high wages and short hours demanded by the hired laborer on the farm, the farmer himself is finding it difficult in some sections to meet the requirements of the city man for his products. There is a great tendency toward a "back-to-the-city" movement, leaving the farmer somewhat at a disadvantage. The labor he has been able to secure has not always been skilled labor. In other countries, such as China and India, where labor is cheap and plentiful, the production of crops has not been hindered, so far as the standpoint of help is concerned. For a few cents the Chinese will work all day long in the wet

rice fields, and consider their lot a rather fortunate one.

In addition to the desirability of skilled labor, there is also the desirability of the skilled farmer -- a man well-trained in the arts and crafts of his profession. As in any other field, education has its advantages, and to-day, more and more, farmers are sending their sons and daughters to be trained at the agricultural schools throughout the country -- those schools established by the Morrill Act during Lincoln's administration. They realize that scientific farming is coming, and is to stay. The more training their boys and girls get, the better fitted they will be to meet the competition that is increasing daily in the production-end of agriculture.

Another important problem is that of marketing farm products. A farmer must not only know how to produce his goods at a profit, but also how to dispose of them at a profit. We have our coöperative marketing associations, our grain elevator systems, etc., which must be managed by skilled, trained leaders. The tendency to-day seems to be toward the more extensive use of such coöperative organizations. Because of the increasing development of scientific farming , the effort to produce more and better produce per acre and still maintain the soil for future generations, and because of the increasing competition in many fields, as well as the development of a newer and more economical type of marketing, those of the farming profession are beginning to realize that farming requires not only skilled, but technical information to insure

its success.

The motto,"All work and no play makes Jack a dull boy", is truly applicable to the farming profession. The days of the isolated farmer are past, those days when he and his family were separated by miles from the nearest neighbor, with only a horse and wagon to pull them over the deep-rutted roads lying between. To-day, good roads, the automobile, telephone, radio, ease of access to the cities with their schools, theaters, etc., have eliminated the drudgery and unsocial life of the past, and have created a life quite similar to that enjoyed by city folk.

Agricultural products have certain definite requirements which must be met the world over. Some are emphasized in certain countries more than in others. The educational and recreational requirements of a satisfied American farmer are not the same as those of a farmer in Borneo. The equipment necessary for a western wheat farm is not the same as that for wheat growers in the valley of the Nile. But there are two things which demand similar requirements throughout the earth for the same agricultural product. These are climate and soil. Under climate we include temperature, rainfall, humidity and influence of winds. For each crop there seems to be a similarity in the required temperature, necessary amount of water, and in the peculiar requirements of the soil, to grow the crop to the best advantage.

In the preceding pages we have examined, somewhat in detail, the requisites for the growth of our agricultural products, and now let us turn our attention to the individual

crops which will be discussed briefly. This discussion is intended to supplement the enclosed charts which outline the leading agricultural products of the world. The crops are arranged according to groups, including grains, sugars, beverages, fibers, fruits, spices and condiments, and miscellaneous crops. The crops in these individual groups are arranged, as nearly as possibly, in the order of their importance. This importance is based upon amount of production, universality of growth, demand for world consumption, and necessity for use.

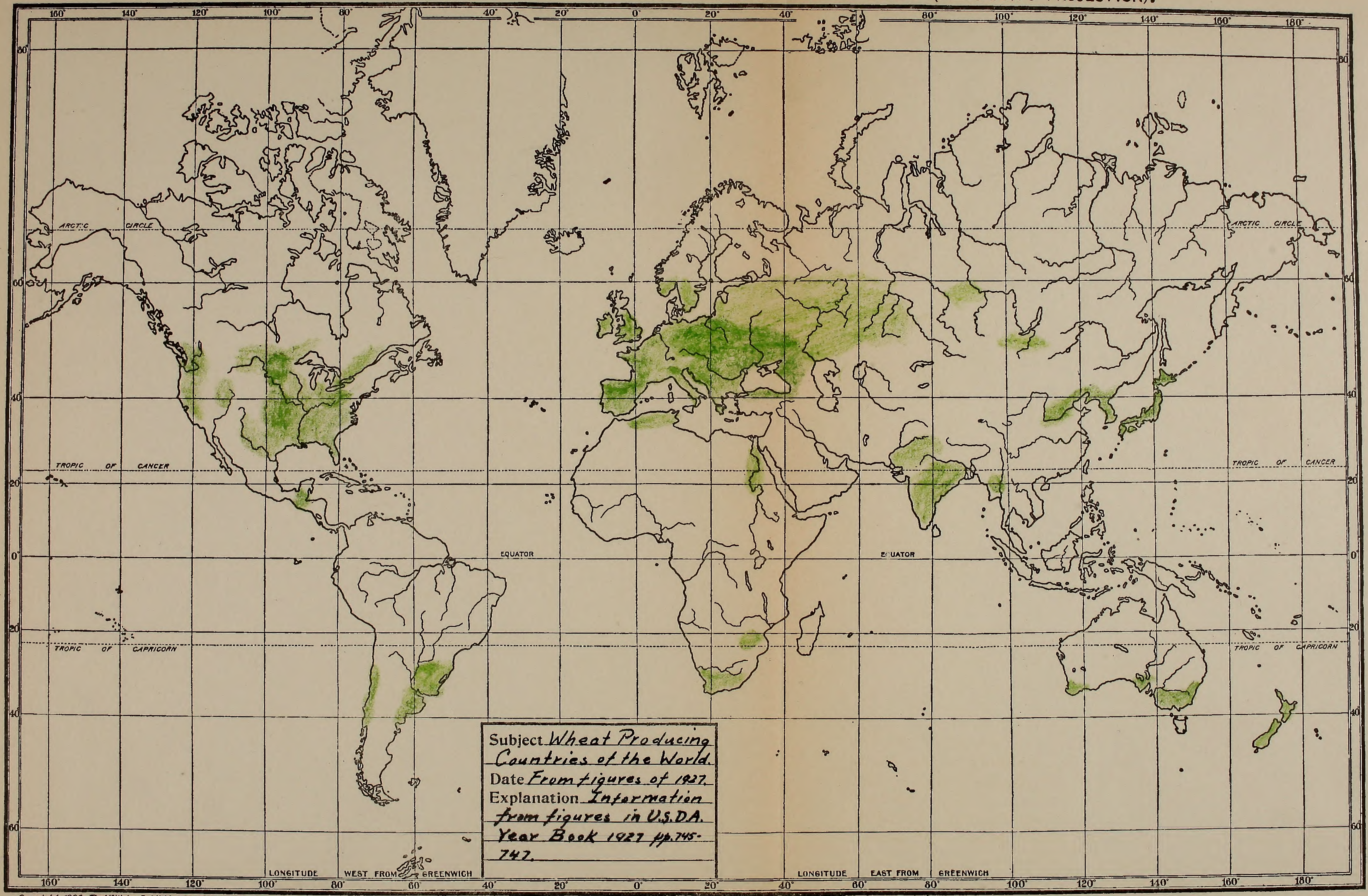
A map of each of the products is included to show the places where each crop is grown to any extent. The regions of more important production are shaded darker than those of less importance. In come instances it will be noted that more than one product is upon the same map.

Chart I

LEADING AGRICULTURAL PRODUCTS OF THE WORLD

NAME	NATIVE SOURCE	SOIL	RAINFALL	TEMPERATURE AND HUMIDITY	ZONE	GROWING SEASON	IRRIGATION CROP	LABOR REQUIREMENTS	ENEMIES	AVERAGE YIELD PER ACRE	LEADING COUNTRY IN WORLD PRODUCTION	YIELD OF LEADING COUNTRY	SECOND LEADING COUNTRY IN WORLD PRODUCTION	YIELD OF SECOND LEADING COUNTRY	USES OF CROPS	GENERAL CONSIDERATION
GRAINS																
WINTER WHEAT	Origin is unknown. De Candolle infers that the original home was Mesopotamia and was distributed from there. Grown in China B.C. 3000. (1)	Ideal soil is a clay loam with a clay subsoil. (2) Wheat requires fertility to be in on available condition, (more so than corn); also requires a well pulverized soil. (3)	30 inches best It grows in regions of 25 inches or less. (6)	Cool, fairly dry climate. (8)	South Temperate, Torrid and part of the North Temperate Zone.	10-11 months, according to time of planting.	May be without irrigation, as on the Western Plains of the U.S. or with irrigation as in far western U.S.	Extra labor at harvest time.	Insects such as Hessian fly, chinch bug, wheat plant lice, locusts, grasshoppers, aphis. Weeds. Fungus diseases as smut, black stem rust. (4)	Belgium leads with 37.1 bu. per acre; Scotland 36.2 bu., Netherlands 34.0 bu., France 21.5 bu. Leading countries: Canada 19.8 bu, Argentine 12.1 bu., United States 14.9 bu. U.S. D.A.Y.B. 1927. Preliminary 1927. pp 744-745.	United States (1927)	871,691,000 bushels.	Russia (1928) Canada (1927)	749,559,000 bushels 444,282,000 bushels.	Food	Wheat most valuable food plants of the world. (5). Planted in the fall.
SPRING WHEAT			Drought resistant wheat grown in Russia with only 10-20 inches. (7)	A cool, wet spring; moderately dry summers, sunny rainless autumn. (8)	North Temperate Zone.	98-120 days. (9)										Planted in the Spring.
RICE	Original home in southeastern Asia. Its cultivation extends back into the dim past. (9)	Medium clay loam is the best soil. Is grown on delta land, inland marshes and rich level, drained prairies. (7)	50 and above inches, preferably 75 inches and more. In Egypt with 10 inches.	Requires warm regions. Hot countries with plenty of water. (1)	South Temperate, Sub equatorial and Sub-Tropical Zones.	About 6 months. (10)	Irrigation and drainage necessary (3)	Hand labor required in the Orient. In the U.S. we use machinery. (4)	Red rice, rice weevil, rice stalk borer (8)	Spain leads with 3566-lbs. Italy next with 2,527-lbs. China ? India 856-lbs (5)	China (1927) (Unofficial) (6)	800,000,000 bushels. 36,000,000,000 bushels	India (1926) (India first	1,467,400,000 bushels. in 1926) (5)	Food, straw, for shoes and hats; starch and alcohol for a drink. (10)	Daily food of one third the human family. (2)
CORN	Burbank says that the Indians developed the teosinte grass into corn in America. (1)	Deep, black soils desirable. Will grow on any kind of soil, almost. (2)	25-50 inches desirable.	Loves warm weather, warm rains, warm nights, sunny days. Hot August days desirable in U.S. (4)	North and South Temperate, subtropical and tropical at higher altitudes. (5)	4-5 months without frost. (6)	No.	Normal requirements of a general farm produce this crop.	Corn borer, smut, corn stalk disease; chinch bug, corn root aphis, cutworm. (3)	Switzerland leads with 51.3 bu. Canada 33.0 bu. United States 28.5 bu. U.S. D.A. Y.B. 1927 Preliminary 1927 pp. 778-779.	United States	2,786,288,000 bushels.	Argentine (1926)	320,848,000 bushels.	Food for man and beast. Used for fattening animals in the West.	70% of World's crop grow in United States. (7)
MILLET	Probably in China, Japan and the Indian Archipelago. (1)	Soil varies with different varities. In general it requires rich friable soil. (3)	Some varities are drought resistant 10-45 inches (7)	Requires hot weather to grow, for some varieties, others temperate temperature. (2)	Temperate, Tropical and Subtropical Zones.	60-80 days for Hungarian millet. Grown as a catch crop in the U.S. (3)	Barn yard varieties need moisture or irrigation. (5)	Grown with cheap labor in Europe and Asia.	Weeds may overcome an early seed crop, stunting growth. (4)	Spain leads with 16.8 bu. in 1920 (9) Austria 13.5 bu. in 1918 (11) India 5.0-6.7 bu. in 1918-19. (8)	India (1918-19) (8)	181,752,000 bushels.	Spain (1920) (9) Russia (1914) (10)	82,275,000 bushels 79,868,000 bushels.	Food for man and forage for animals. (2)	A great human food crop of Europe and Asia. (6)
OATS	Original wild form not known believed to have been in Western Asia and Eastern Europe. (3)	Does better in loam and clay soil than sandy soils; very rich land or low, loose soil can be used. (4)	Requires large supply of soil moisture. About 20-75 inches. (6)	Cool, humid, not too warm; considerable rainfall. (2)	Temperate Zone. Some in Sub-Tropical Zone.	95-120 days Spring or Fall sown. (5)	No.	Normal care.	Smut, rust and blight; grain weevil or moths are the worst insect pests. (7)	Netherlands leads with 60.0 bu. per acre Switzerland 60.0 bu. Canada 34.2 bu United States 27.8 U.S.D.A.Y.B. 1927 pp. 792-793.	United States (1927)	1,195,006,000 bushels	Russia(E) (1926)	762,552,000 bushels	Feed for farm animals, especially horses also made into oatmeal. (1)	One of the leading grain crops throughout the whole Temperate Zone. (8)
RYE	Thought to have originated from a wild perennial form found in South Europe to Central Asia. (2)	Will grow on poor land. It responds to good soil, but is so vigorous it is used on poorer soils. (4)	(5) Requires a large supply of soil moisture at times. About 20-75 inches. Grown in Semiarid lands	Will yield a crop in cold or moist, in warm or dry climates and regions. (6)	Temperate and Sub-tropical Zones.	About 6-7 months when plowed under, 10 months when grain is harvested. Some rye planted in Spring (7)	No	Requires little care, although it responds to good care. (8)	Rust, ergot (a disease), weeds, chinch bugs, grass hoppers, army worms. (9)	Belgium leads with 35.0 bu. Germany 23.2 bu. Russia(E) 13.2 bu. United States 16.0 bu. U.S. D.A.Y.B. 1927. pp 768-769.	Russia (Europe) (1926) (1928)	847,985,000 bushels. 968,465,000 bushels (10)	Germany (1927)	269,040,000 bushels	Food. The chief bread-stuff of parts of Europe. (1)	Will yield a fair crop on poor land in any climate. (3)
BARLEY	Native of Western Asia (1)	Rich loam is best. Does best on well-drained land. (2)	10-50 inches.	Some varieties require a warm climate and a normal amount of rain; others cool days, others little rain. (5)	Temperate and Sub-tropical Zones.	About 5-10 months. There are both spring and winter varieties. (6)	No.	Normal Care.	Loose and Covered Smut, Hessian Fly. (7)	Belgian leads with 46.6 bu. Netherlands 45.9 bu. United States 28.0 bu. Germany 34.4 bu. U.S. D.A.Y.B. 1927 pp 802-803	United States. (1927)	265,577,000 bushels	Russia (Europe) (1926)	230,504,000 bushels.	Grown principally as a stock feed. (3)	Valuable because it ripens in a short season. (4)

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject *Wheat Producing Countries of the World.*
Date *From figures of 1927.*
Explanation *Information from figures in U.S.D.A. Year Book 1927 pp. 745-747.*

Fig. 8

WHEAT

Down through the ages wheat has always been used as a food, and to-day, with its thousand varieties, it is used in some form by every civilized people on the earth. No other cereal, with the exception of rice, can be compared with it in the amount grown and consumed. We have a world's annual production of wheat amounting from three to four billion bushels. This includes an annual world-surplus of from 650 to 750 million bushels (1) which is exported to those countries which cannot produce what they need for their own consumption. The United Kingdom is one of the chief importing countries.

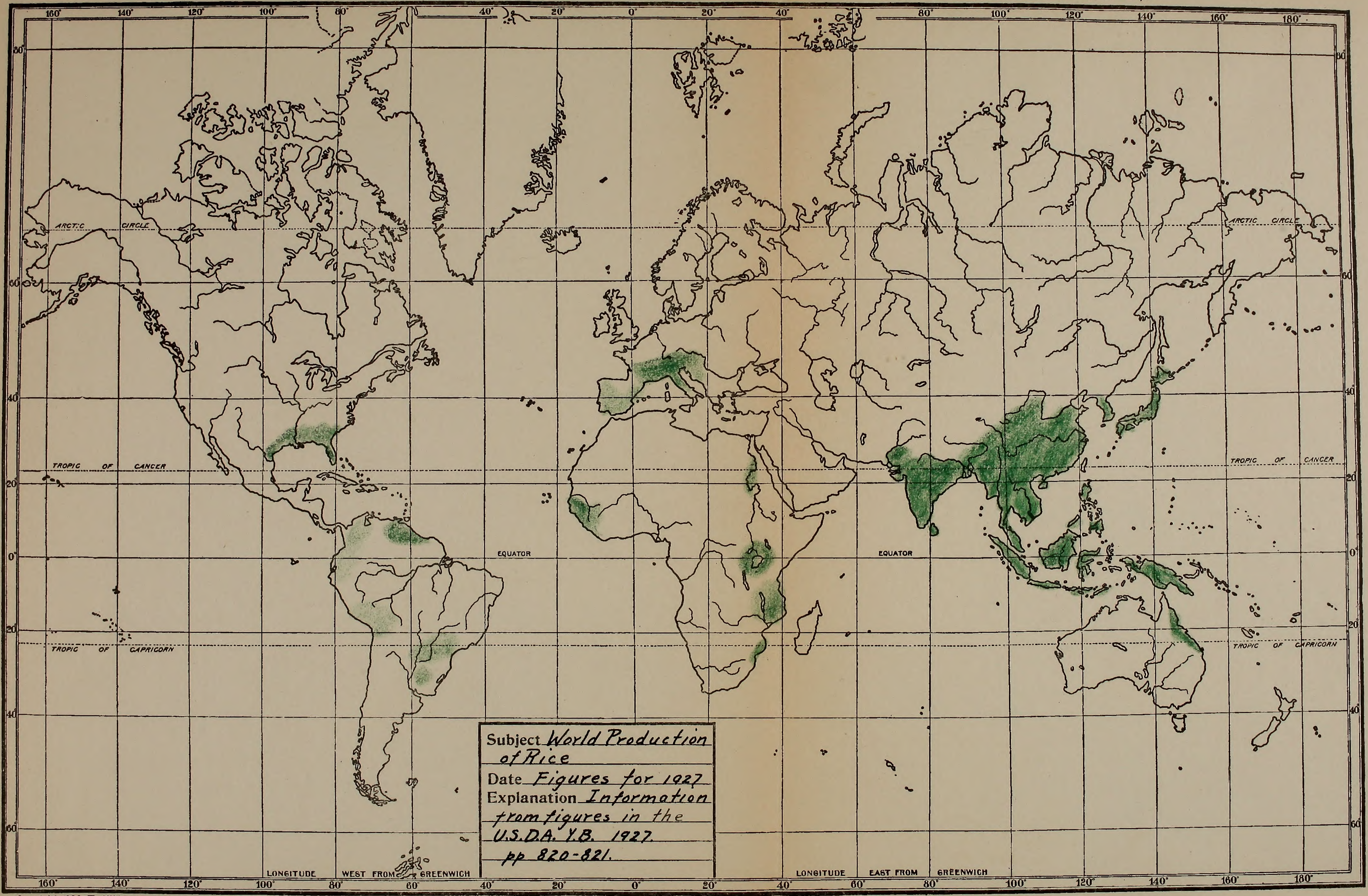
Winter wheat is that which is sown in the fall, allowed to stand through the winter protected by snow, and coming up in the spring is harvested during the late summer. It is grown in that part of the world where the winters are not too severe, and where there is usually enough snow to protect the tender shoots before the ground freezes hard.

The spring wheat, as its name indicates, is planted in the spring and harvested in the late summer or early fall. This is grown in a hardier climate than that favorable for winter wheat.

Concerning the future possibilities of wheat, it may be said that there are vast, undeveloped areas adapted to wheat, in South America, Russia, Siberia and Canada. Also, when comparing the yield per acre in the United States with that of the other countries listed on the chart, it can be seen that the

(1) Soil Culture p-249

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. **THE WORLD** (MERCATOR'S PROJECTION).



Subject *World Production of Rice*
Date *Figures for 1927*
Explanation *Information from figures in the U.S.D.A. Y.B. 1927. pp 820-821.*

Fig. 9

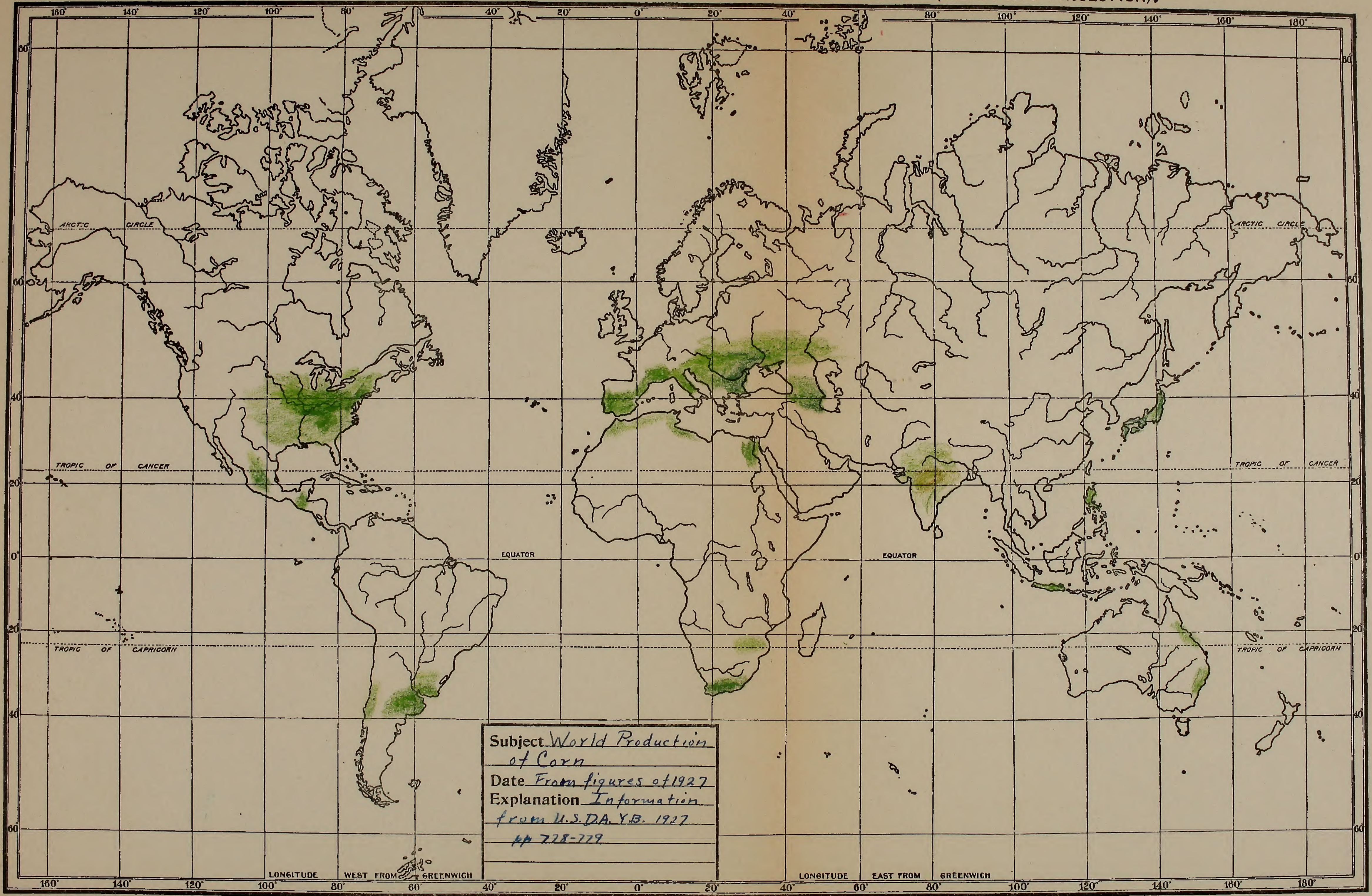
farmers of the country producing the world's greatest supply are seemingly satisfied with an extensive, rather than an intensive type of production. The United States, because of its fertile soil and wonderful advantages, has the opportunity of producing a yield per acre in wheat that will outshine the present leaders. What the soil in the wheat regions can do has never been demonstrated, and it has been stated by Dr. Taylor (author of Soil Culture) that "our wheat farmers must increase the efficiency of their soil or surrender their supremacy in the production of mankind's most important food".

RICE

Rice and wheat go hand in hand, competing for first place as the cereal-food of the human race. The world-crop amounts to about 175-200-billion pounds,(1) and China, according to the United States Commerce Year Book, (1928, p-150) is the world's largest producer of rice, soy-bean, and tea. Rice is the principal article of food in India, Japan, and China, India consuming 278 pounds per capita annually, while Japan uses 282 pounds per capita.(2) It has an advantage over wheat in that it may be thrown into a pot, boiled for twenty minutes, and be ready to serve. Wheat, on the other hand, must be ground into flour and be subjected to machine manipulation before it is ready for use. The natives can gather their own rice, winnow it, and pound it in their crude mortars to remove the husks, making the preparation for its use comparatively simple.

(1) U.S.D.A.Y.B. (1927) p-821. (2) Soil Culture p-293.

McKinley's Desk Outline Maps. Double Size. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject World Production of Corn

Date From figures of 1927

Explanation Information from U.S.D.A. Y.B. 1927 pp 728-729

Fig. 10

Rice requires level, low, land which can be easily flooded in the springtime when the new, young, shoots are coming up, and which can be easily drained in the fall in order to facilitate the harvesting of the crop. Heat and water are essential. The United States can produce more rice per person by use of machinery, than China or Japan, despite their generations of rice-growing, and one man in the United States produces eighty acres of rice to one acre in Japan.(1) Because the United States raises more than enough for its own consumption, there is a slight surplus for exportation.

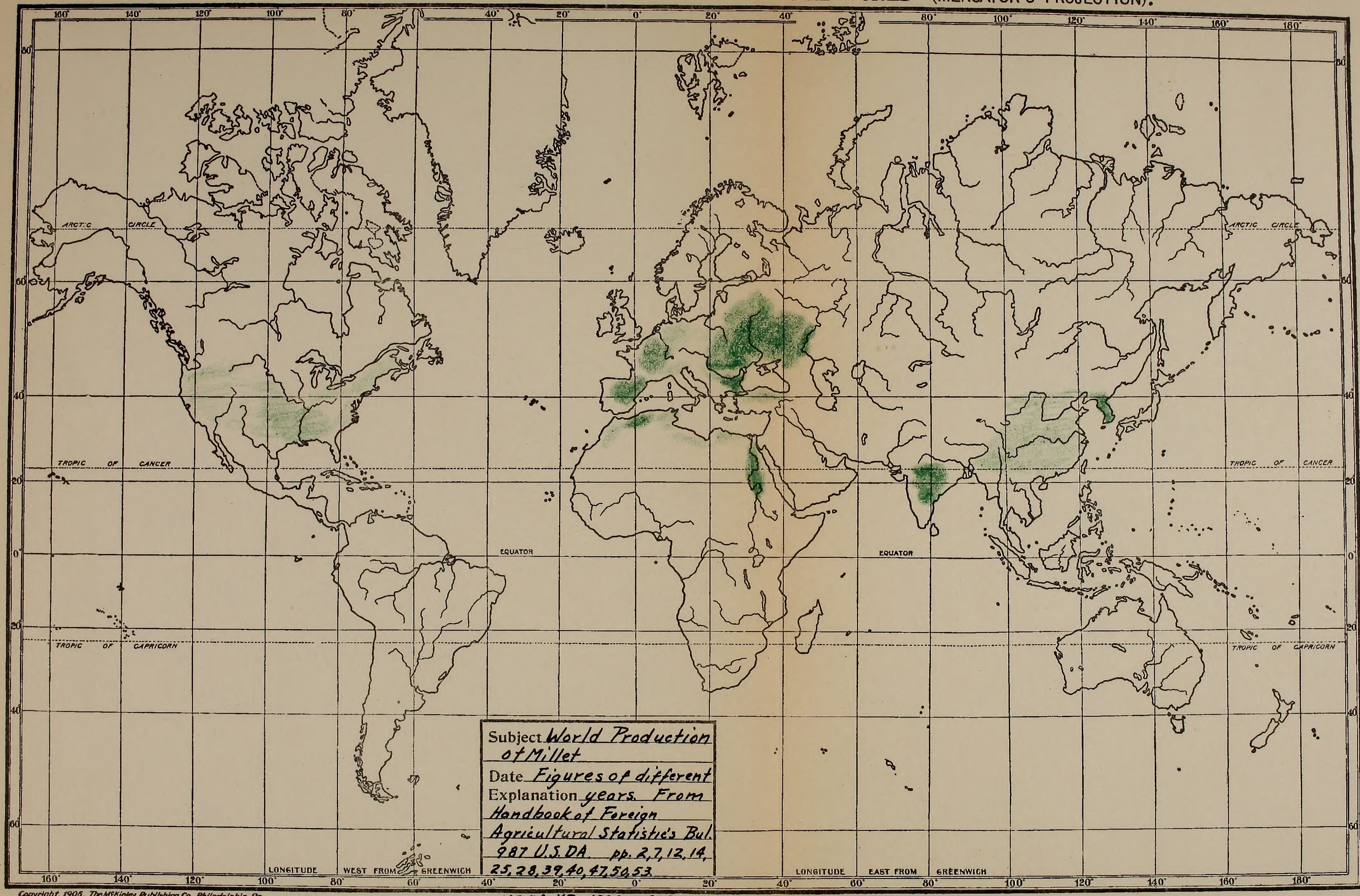
There are two kinds of rice grown, according to location, ---the upland and lowland varieties. Most of the rice is of the lowland variety, which, as has already been mentioned, requires irrigation. The upland varieties are grown in the fertile uplands without need of irrigation.

CORN

In the United States, corn has the most value in money, is the largest ,in quantity, raised, and in all probability is the most useful food produced. With us it is very important as one of the best foods for fattening hogs and cattle, and only a small percentage of the crop is used for human consumption; whereas in Mexico the common people depend upon corn as their chief diet. World production amounts to about four-billion bushels, of which the United States produces about seventy percent. The United States has very favorable climatic

(1) Ind. Geog. p-69

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject *World Production of Millet*

Date *Figures of different*

Explanation *years. From Handbook of Foreign Agricultural Statistic's Bul. 987 U.S.D.A. pp. 2, 7, 12, 14, 25, 28, 39, 40, 47, 50, 53.*

U.S.D.A. Y.B. 1928 p 838

Fig. 11.

conditions, and rich, fertile soil, so this crop can be grown in practically all parts of the country where the altitude is not too high. Despite the supremacy which we now maintain, we are not getting the yield per acre that the favorable conditions warrant. Many farmers have grown 200-250 bushels per acre, and thousands have grown over 100 bushels per acre, yet the average of the country is only about 30 bushels per acre. We can, and should, increase the yield in the corn belt, because there is an increasing yearly home consumption to supply, as well as increasing export demand. The future possibilities of this crop are very great, and the United States has every opportunity to maintain its supremacy in the production of this commodity.

MILLET

Millet is one of the important cereal grains of the world, because it is raised by the poorer peoples for both grain and forage purposes. It is grown chiefly in India, China, Japan, North Africa, and in many countries of Europe, notably in Austria, Hungary, Poland, Russia, Roumania, and Bulgaria, where it forms the staple diet of one-third of the world's population. After rice, it is perhaps the most valuable single article of food in India, where over thirty-five million acres are planted annually.(1)

There are many varieties of millets, such as the foxtail millets, German and Hungarian millet, dura, pearl millet, and kaffir corn. In India the two types of millet grown are the jowár and bajrí. The Poor Man's millet is cultivated, during

(1) Americana Vol. 19, p-125.

six weeks of the rainy season, over a large part of India up to an altitude of 6,500 feet in the Himalaya mountains. This is used chiefly by the poorer classes, who eat it boiled in milk, or parched. The flour of another variety is used for bread, when mixed with buttermilk, and is considered more nutritious than rice. The bread is eaten with butter and condiments of various kinds, while the stalks are used as fodder for the cattle.

Juár is cultivated in most countries, in the cotton area, between the latitudes 45°N. and 35° S. In India and Africa it is of the greatest value in the upland tracts between 15° and 30°, while in the warmer, more moist regions of Lower Burma and Ceylon, it is not an important crop. There are two great crops of juár, of which the kharíf ripens in the autumn, and the rabí ripens in the spring. This yields a nourishing grain, about the same quantity per acre as wheat or rice (900 lbs.), and ten times as much in fuel and fodder as ordinary cereal crops. It is important on land not flooded by water, and is therefore the staple grain in India, where the black and mixed black soils predominate, provided the rainfall is moderate and well distributed. Where the rainfall is excessive, rice takes its place, or,on the sandy loams and shallow soils, it is replaced by bajrá. Juár is grown to meet the food necessities of the people.

The significance of millet in the village economy in India is twofold, in that it not only feeds the villagers, but supports their most precious possessions, namely their cattle, as well. The people count their wealth in their cattle

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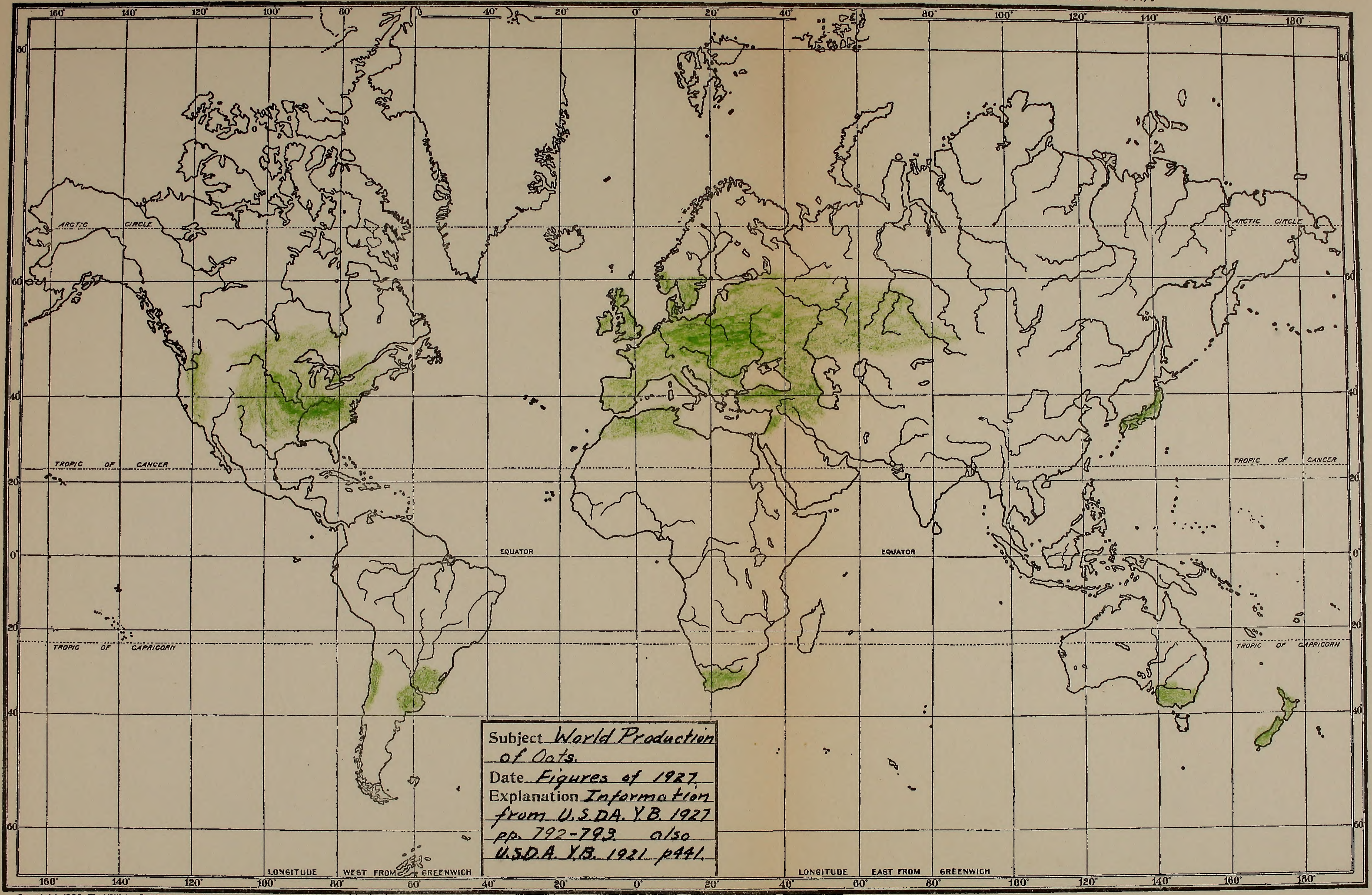

Subject World Production of Oats.
Date Figures of 1927.
Explanation Information from U.S.D.A. Y.B. 1927 pp. 792-793 also U.S.D.A. Y.B. 1921 p441.

Fig. 12.

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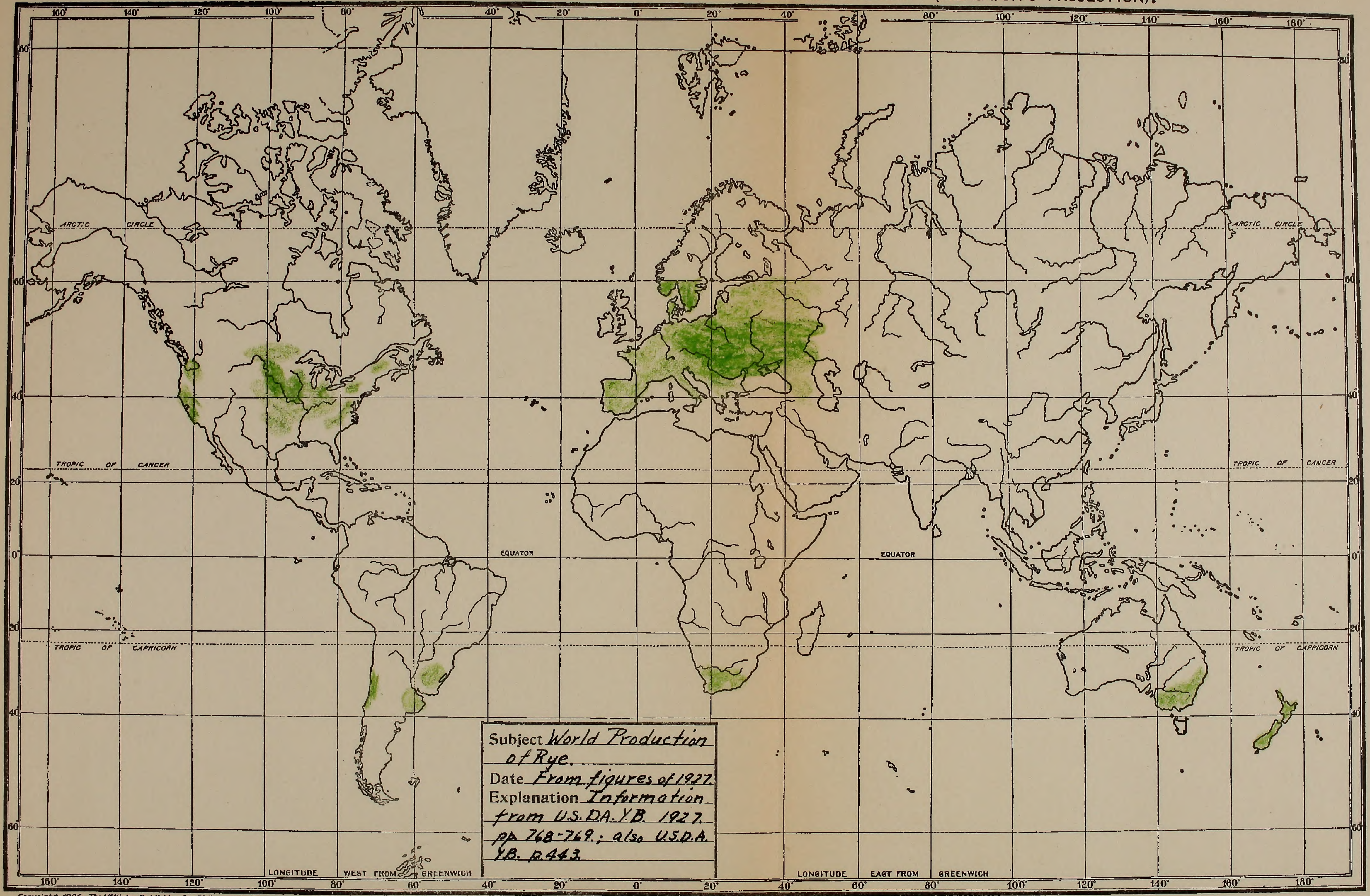

Subject World Production of Rye.
Date From figures of 1927.
Explanation Information from U.S.D.A. Y.B. 1927. pp. 768-769; also U.S.D.A. Y.B. p. 443.

Fig. 13

which are not used for milk, but for beasts of burden, and since the forests furnish poor grazing, millet fodder is the dependable cattle food.

Because of its many varieties, and the uses to which it is put, millet is one of the most important cereals in the world. As the principal food for so many millions in Asia, Africa, and Europe, and as one of the leading fodder crops of the world, it continues to serve a double purpose as it has done since prehistoric time.

OATS

Oats are one of the leading grain crops of the temperate zone. There is a world-production of about four and one-half billion bushels, and about sixty percent of this is grown in Europe, while twenty-five percent is raised in the United States.(1) It is grown for feed for farm animals, as well as for straw, and a very small percentage is used for human consumption. When compared with wheat, although a larger number of bushels of oats are produced in the world, the oat crop is the less important of the two.

RYE

Rye is a cereal which is more favored by many people for breadstuff than wheat. In Europe approximately 200-million people depend upon rye for their bread, though the bread is somewhat darker, slightly heavier, and not quite so nutritious as that made from wheat. Because it will make a fair yield on poor land, and is a hearty crop, rye is probably the most reliable of any of the cereals to grow. The annual production

(1) Ind. Geog. p-66.

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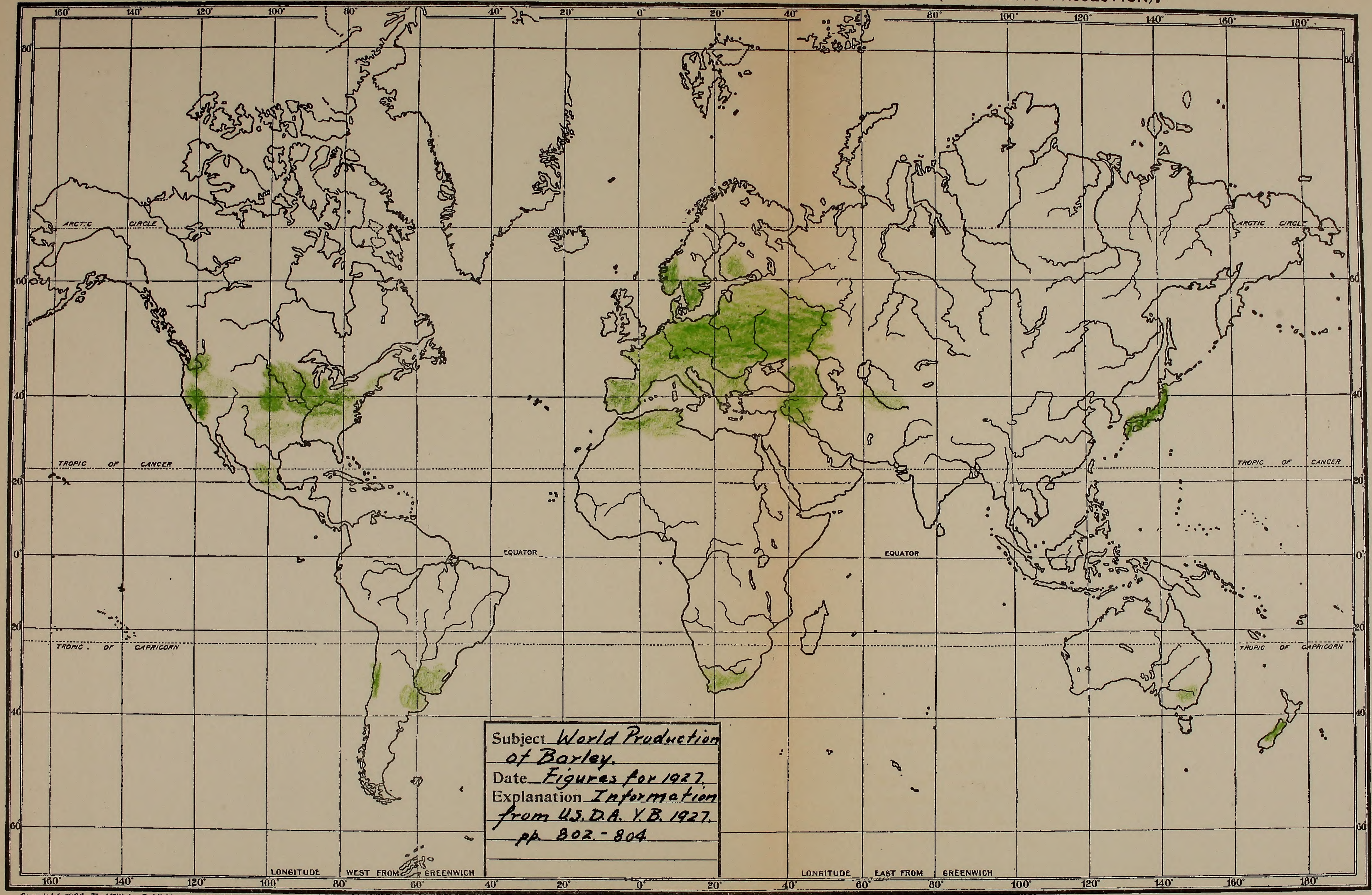

Subject *World Production of Barley.*
Date *Figures for 1927.*
Explanation *Information from U.S.D.A. Y.B. 1927. pp. 802 - 804*

Fig. 14

of the world is nearly two-billion bushels, and that of the United States about sixty-million bushels.(1) Because of its good qualities, rye will doubtlessly be grown in increasing amounts, especially in regions of large populations and poor soil conditions.

BARLEY

Barley is grown even more widely over the earth than rye, and its production has spread from the earliest times all over the world which now produces annually about one and one-half billion bushels.(2) Its one advantage, the ability to ripen in a short season, makes it the bread-crop of the people of the far north, even within the arctic circle, and it can also be grown where the rainfall is too light for other cereals, as on the edge of deserts. In China, Japan, and India, two crops are obtained from the land in one year. In the United States, barley is not particularly important as a crop, although it leads in world production, for most of the crop is fed to farm animals. The demand for barley bread in this country is not large, but it is probable that the increase in production of barley will continue to a great extent here. In northern European countries, and those countries where it is now grown, the production will be increased because of its use for making barley bread for the millions of people there. The people of the United States do not seem to have developed a taste for this coarser bread-stuff.

(1) U.S.D.A.Y.B. pp 768-769. (2) Soil Culture p-273.

Chart II

Name	Native Source	Soil	Rainfall	Temperature and Humidity	Zone	Growing Season	Irrigation Crop	Labor Requirements	Enemies	Average Yield Per Acre	Leading Country in World Production	Yield of Leading Country	Second Leading Country in World Production	Yield of Second Leading Country	Uses of Crops	General Consideration
Sugars																
Cane Sugar	Probably in the region of Cochin China, India or Malaya. (1)	Deep, rich soil. Black, moist delta lands are excellent. (5)	At least 60 ins. per year, or equivalent artificial supply (2)	Average temperature of 80° F. (3) No frost for 8 mo, much sunshine and warm weather (4)	Tropical and Subtropical Zones. Subequatorial Zone	10 months Cutting is done as the flowers begin to fade. (6)	May-be	In most countries hand labor is used almost exclusively. In U.S. machinery is used up to harvest time	Sugar Cane beetle and borer; many leaf and stem diseases.	Average about 25 ton of cane per acre. Hawaii with irrigation yields over 100 tons per acre. (5)	Cuba U.S.D.A.Y.B. 1927	5,049,632 short tons (1926-27 figures) pp 957-958	India production of gur, a low grade of sugar	3,593,000 short-tons (1926-27 figures)	Food By products such as molasses and rum.	Refining not done where cane is raised. U.S. has imported refineries.
Beet Sugar	Grows wild in Europe, North Africa and Asia as far as India (3)	Rich, deep loamy soil (2)	10-50 inches	Climate having a mean temperature of about 70° during growing season. (2)	Temperate Zone	Plant is biennial (2)	May-be	Hand labor "down on your knees" required (1)	Leaf eating insects; dampening off, crown gall crown rot (2)	Switzerland leads with 13.8 Short Tons. Denmark next with 12.2 Short Tons Germany 11.2-S.T United States 10.4-S.T	Germany U.S.D.A.Y.B. 1927	11,964,000 Short Tons Preliminary	Russia 1927 pp 956.	10,913,000 Short tons.	Food	Producing about ½ of world's supply of sugar.
Beverages																
Tea	Assam in India is thought to be the native source Some say China (7)	Wide range of soils. Good drainage is essential. Deep and fertile (5)	About 50-100 inches	Warm, damp climate. Mean Temperature about 70° (2)	Subequatorial South Temperate Zone.	Perennial Trees Three pickings per year. (4)	No	Hand labor is essential, and determines its location, where it may grow partly. (3)	Red Spider	Yield per hectare Japan leads with 843,8 Kilogrammes Ceylon next 574,2 Kilogrammes.	China (1927) India (1924) International Yearbook of Agricultural Statistics 1924-25 pp 142-143	8,000,00000-lbs. (1) 168,282,000 Kilogr.	Java and Summatra (1923)	48,829,000 Kilogr.	Beverage	Rich growth required
Coffee	Liberian coffee on West coast of Africa. (1)	Rich well drained soil. Higher elevations desired. (2)	Anything between 75 and 120 inches well distributed. (2)	Hot moist climate is best. (2)	Equatorial and Subequatorial Zones.	Perennial Trees From time of blossoming to time of ripening is 7 or more months (3)	No	Hand labor essential. Cheap labor.	Winds, leaf disease, Weeds. (4)	Yield per hectare 1924-25 Brazil leads with 4,2 quintaux quintals Guatomata 4,1 (6)	Brazil (6)	8,791,358 quintaux quintals	Columbia	1,106,000 quintaux quintals	Beverage	Next to tea Coffee is world's chief beverage. (5)
Cacao	Thought to have been cultivated from wild state in Central America. Introduced in Central America before 1492 (1)	Deep Alluvial soil well drained with thick decayed vegetable matter on top. (2)	Abundant 50-100 inches (2)	Warm and Moist (2)	Equatorial and Subequatorial Zone. (2)	Perennial Trees Bear at 5 yrs. (3)	May-be.	Harvest requires great care, as buds and blossoms, for next harvest are easily injured (4)	Fungus Diseases (4)	3,00 cwt. to 4,67 cwt. in Ceylon 1922-23 (5)	Gold Coast International Year Book of Agricultural Statistics 1924-25 pp. 140-141.	2.269.128 quintaux quintals.	Brazil	688.000 quintaux quintals	Cocoa and Chocolate.	Requires well protected, shady, location. no strong winds. (2)
Fibers																
Cotton	Cotton was spun and woven in the Old World before the dawn of history. It has been native of the tropics of both hemisphere (1) (10)	Medium grades of loam, containing 25-30% of clay and about 40% silt. These are porous, easily worked, drained, and early warmed in the spring. (2)	50-75 in. Although Egypt, by irrigation raises cotton with 10 in. per year. (3)	Temperature during growing season is from 60°-100°F. (4) Long, warm, growing season, with even distribution of rainfall, preferred nightly. (11)	South Temperate, Subequatorial and Tropical Zones.	6 months long. (5) Warm season of 6-7 months. (9)	May-be. Egypt uses the Nile to give necessary moisture by irrigation (12)	Hand picking is required. Supply of labor determines how much cotton can be grown. (6)	Wilt or Black Root, Anthacnose, leaf blight; Cotton louse, boll weevil, bollworm. (7)	Egypt leads with 380 lbs. of lint. Anglo-Egyptian Sudan 236 lbs. United States 152.3 lbs. p.915 U.S. D.A. Y.B. 1927 Preliminary 1927-28 pp 916-917.	United States	12,789,000 bales (bale = 478 lbs)	India	4,597,000 bales.	Clothing and textile materials (8) Cottonseed oil, oil cake for cattle feed. (13)	This is the clothing material for one half the earth. It is the leading export of the United States. (8)
Flax	Native country unknown, supposed to be in the Caucasus region (1)	Requires rather rich productive soils, especially for fiber. Does well on raw new land. (2)	20-50 inches	Will grow in both dry and humid climates; dry for seed, cool and humid for fiber. (3)	Temperate and subtropical Zones.	3-4 months. It is sensitive to frost. (4)	No.	Fiber requires much hand labor in preparing the fiber, so the U.S. imports its fiber (6)	Wilt is worst disease. Flax rust. (5)	Seed Production 9.1 bu. in U.S. 11.5 bu. in Argentine.	Argentine U.S.D.A. Y.B. 1927 - 1927 Preliminary pp 811-812	81,216,000 bushels	United States	26,583,000 bushels.	Fiber for making linen. Seed for linseed oil.	Tea, silk and flax fiber require much hand labor; so raised where this is had.
										Fiber Production	Russia (1926)	780,038,000 bushels	Poland	147,700,000. bushels.		
Hemp	Oldest records indicate hemp cultivated in China 2800 B.C. (7)	Require a rich moist soil having good natural drainage. (2)	20-50 inches	Temperate Climate (3)	Temperate, Subtropical, Subequatorial Zones.	About 4 months. (4)	No.	Work of growing and preparing largely done by hand labor. Cheap labor required. (5)	Readily injured by frost.	Hemp Seed. Yield per hectare Syria - 9,4 q.q. Russia (E) (4,6) q.q.	Russia (Europe)	2,922.000 quintaux quintals.	Russia (Asia)	386.000 quintaux quintals	Substitute for flax; cordage, rope, fish lines, rugs, carpets. Used as a drug in the East. (6)	Cheap labor of southwest-central Russia and somewhat in Italy consentrate the industry there. (7)
										Hemp Fiber. Spain - 18,1 q.q. Russia (E) 4,3 q.q. Inter. Y.B. Agr. Stat. 1924-25 pp 154-155	Russia (Europe)	2.744.000 quintaux quintals.	Italy	740.000 quintaux quintals		

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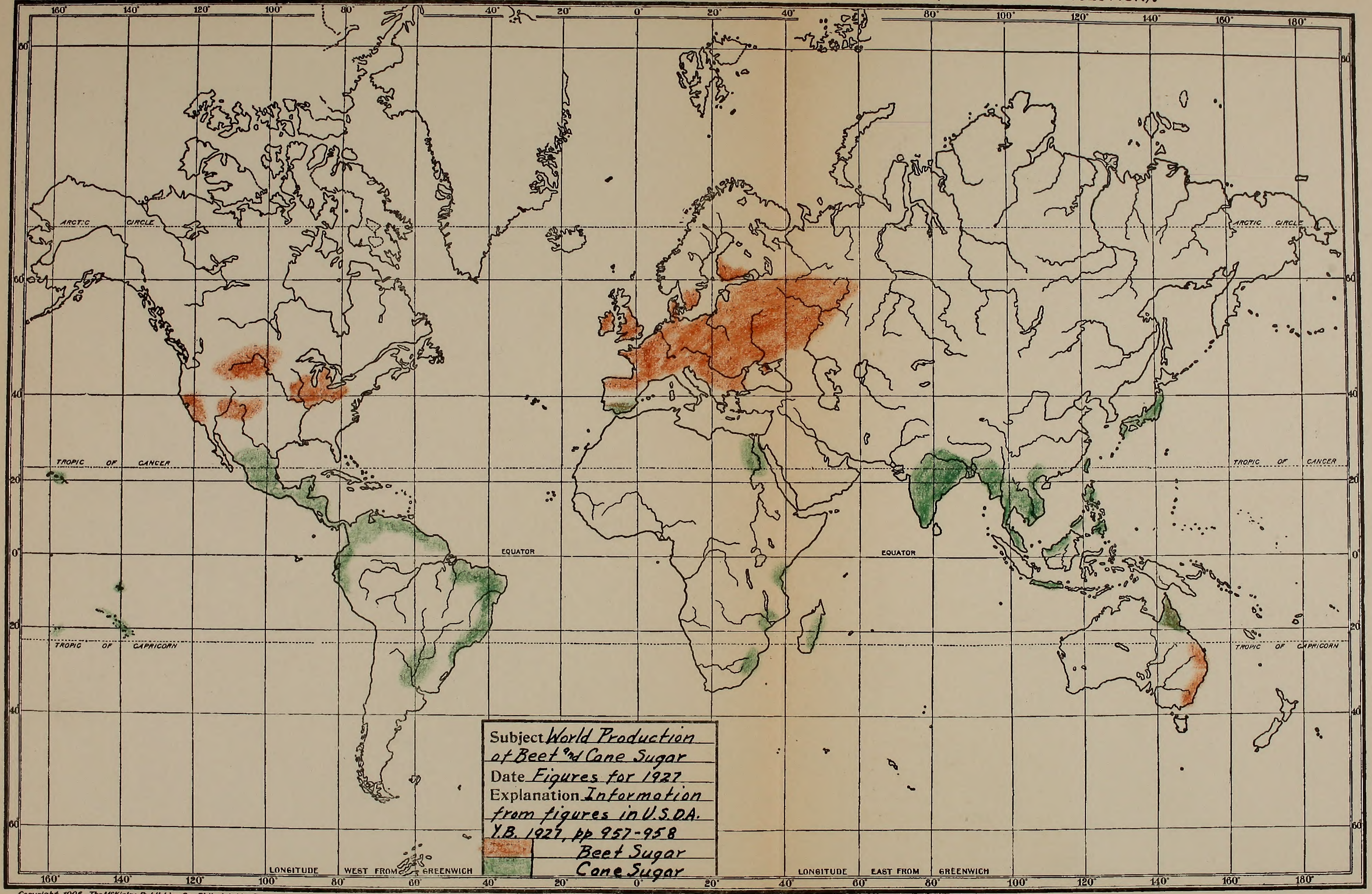

Subject *World Production of Beet and Cane Sugar*
Date *Figures for 1927*
Explanation *Information from figures in U.S.D.A. Y.B. 1927, pp 957-958*
🟧 *Beet Sugar*
🟩 *Cane Sugar*

Fig. 15

SUGAR --CANE & BEET

Cane sugar is a tropical and sub-tropical plant, cut once each year, after which a new crop springs up from the old root stocks. It requires no frost for at least seven or eight months, much sunshine and warmth, plenty of rain in frequent showers, and a deep, rich soil.(1) Cuba and India produce between them over one-half of the world's crop which consists of about eighteen-million short-tons. Java, Brazil, Australia, Hawaii, and Porto Rico are also important producers of cane sugar.(2) The cane is ground, and the raw sugar made near the cane fields, though it is not refined in the tropics, but near the source of consumption.

Beet sugar is grown from certain varieties of beets having a high sugar content. It is a temperate zone product and is produced in every European country, having also increased rapidly in the United States in the last thirty years, until in 1927 the United States ranked fourth in its production. This is another case where labor has influenced the slow development of this product in the United States, because beet raising requires considerable hand-labor which in the United States is scarce and costly. In Europe where labor has been plentiful and cheap, the crop has developed without hindrance, unless it has been lack of land. The United States has large land areas which can grow these beets, so the mill owners contract with the farmer for their crops, aid them with their seed, methods of growing and harvesting, and

(1) Ind. Geog. p-91.   (2) U.S.D.A.Y.B.,1927, pp-957-958.

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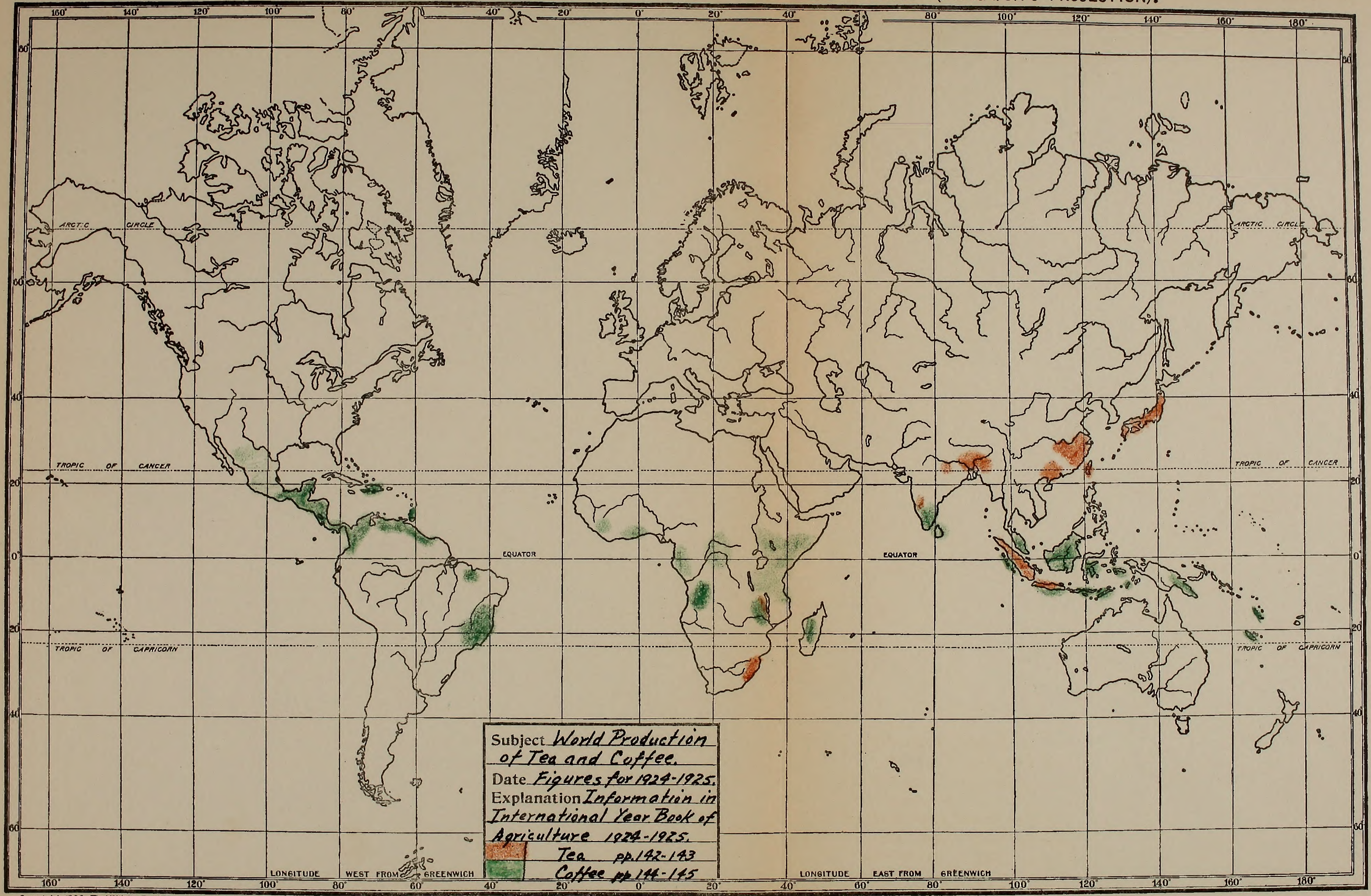

Subject World Production of Tea and Coffee.
Date Figures for 1924-1925.
Explanation Information in International Year Book of Agriculture 1924-1925.
🟥 Tea pp.142-143
🟩 Coffee pp.144-145

Fig. 16

through this coöperative work, the industry can succeed in this country.

As the population of the world increases, and as the standard of living becomes higher, there is going to be an increase in the demand for sugar which must be met by an increased production. This opens up the future for the sugar industry; for new sugar areas to be opened, increased yield per acre, and improved machinery.

TEA

Tea and coffee are the two most important of the cooked beverages used in the world to-day, tea being probably more important in the eastern hemisphere than in the western. The Englishman's tea has become institutional with him -- an afternoon without tea, is an afternoon spoiled. China is the leading producer of tea in the world, and India ranks a close second. The tea plant is a bush, which when it is unpruned, may attain the height of a small tree. On the tea plantations the bushes are kept low enough so that the leaves may be plucked from the ground, which necessitates much hand labor, and is limited to the warm regions where such labor is plentiful and cheap. The world crop for 1924 amounted to about 400-million kilograms, and the industry is keeping up with the demand.(1)

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(1) Int. Y.B. of Agr. Statistics, pp-142-143.

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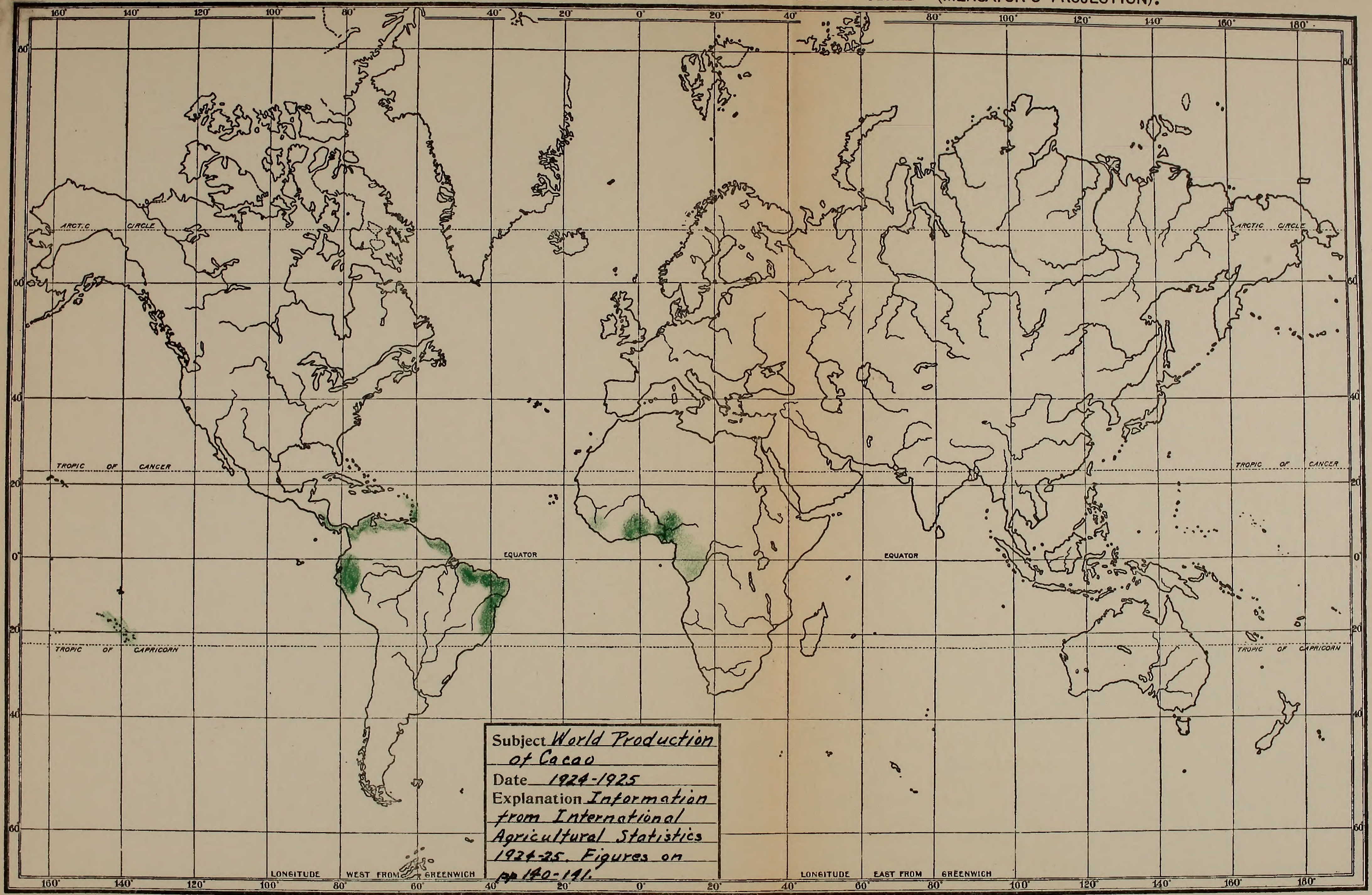

Subject *World Production of Cacao*

Date *1924-1925*

Explanation *Information from International Agricultural Statistics 1924-25. Figures on pp 140-141.*

Fig. 17

COFFEE

Coffee is one of the world's popular drinks, especially so in the United States, where we consume more than one-million pounds per day,(1) and western Europe is constantly using more and more of this beverage.

South America, with Brazil in the lead, is the continent ranking first in production, and Central America also is an important source of supply. Coffee is grown successfully on hilly uplands in Brazil, since these are well drained and out of danger of severe frosts from the valley below, being produced on great plantations, with large capital and modern machinery. The coffee of Brazil is largely grown in the single province of Sao Paulo, and most of it is exported through the single port of Santos. Despite the fact that there is a movement advocating less use of coffee because of its stimulation, the production is not decreasing, and the demand for it is seemingly increasing.

CACAO

Cacao is the bean from which cocoa is obtained. There are two principal sources of production: First, the west coast of Africa; second, tropical America, where Brazil and Equador are the leading producers. The cacao beans are the seeds of a fruit which grows from the large branches and trunks of the cacao tree, and the fruit itself is about the size of a cucumber. In Africa we have both the wild cacao and the plantation production. In Equador plantations contain as many as thirty to forty-thousand trees.(2) The trees do not bear fruit until they

(1) Ind. Geog., p-328. (2) Ind. Geog., p-312.

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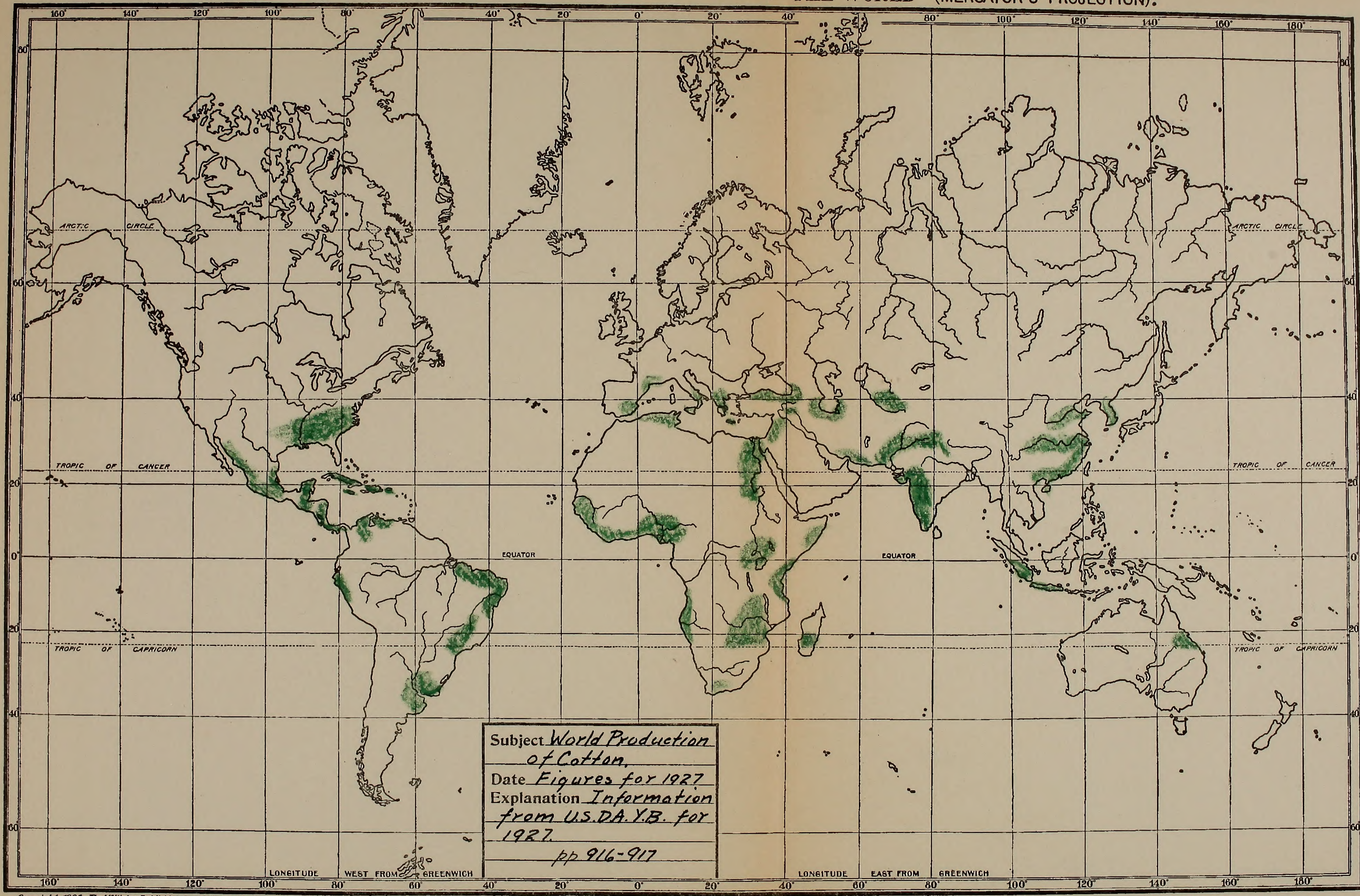


Subject World Production of Cotton.
Date Figures for 1927
Explanation Information from U.S.D.A.Y.B. for 1927.
pp 916-917

Fig. 18.

are at least five years old, and care must be taken in picking because of the ease of injury to the buds and blossoms which are to bring forth the next harvest. Each pod contains about sixty seeds arranged in rows which must be extracted, cured, and dried, in order to become the cacao beans sold in world trade.

As we are increasing our use of sugar, as well as candy, and sweets, the chocolate which is required will probably be demanded in increasing amounts as the years go by. Plantation cacao will naturally be desired, and those regions which are hot and damp will necessarily have to meet the demand.

COTTON

Cotton is one of the most important of our fibres. The importance of cotton is becoming greater as population increases and it is put to new uses. It is soft, durable, of fine texture, and cheap; it supplies the need which the more expensive textiles do not meet. At the present time, silk and rayon are in great demand, due to the vogue of fashion, successful advertising campaigns, and the attractiveness of the product. If cotton can obtain the popularity that silk and rayon have to-day, by intensive advertising, by producing cloth of fine texture and attractive patterns, appealing to the discriminating taste of women, it will then be one of the principal, if not the principal, kinds of clothing demanded by the people. At the present time about one-half the people of the earth depend upon cotton for clothing, as well as for miscellaneous uses.

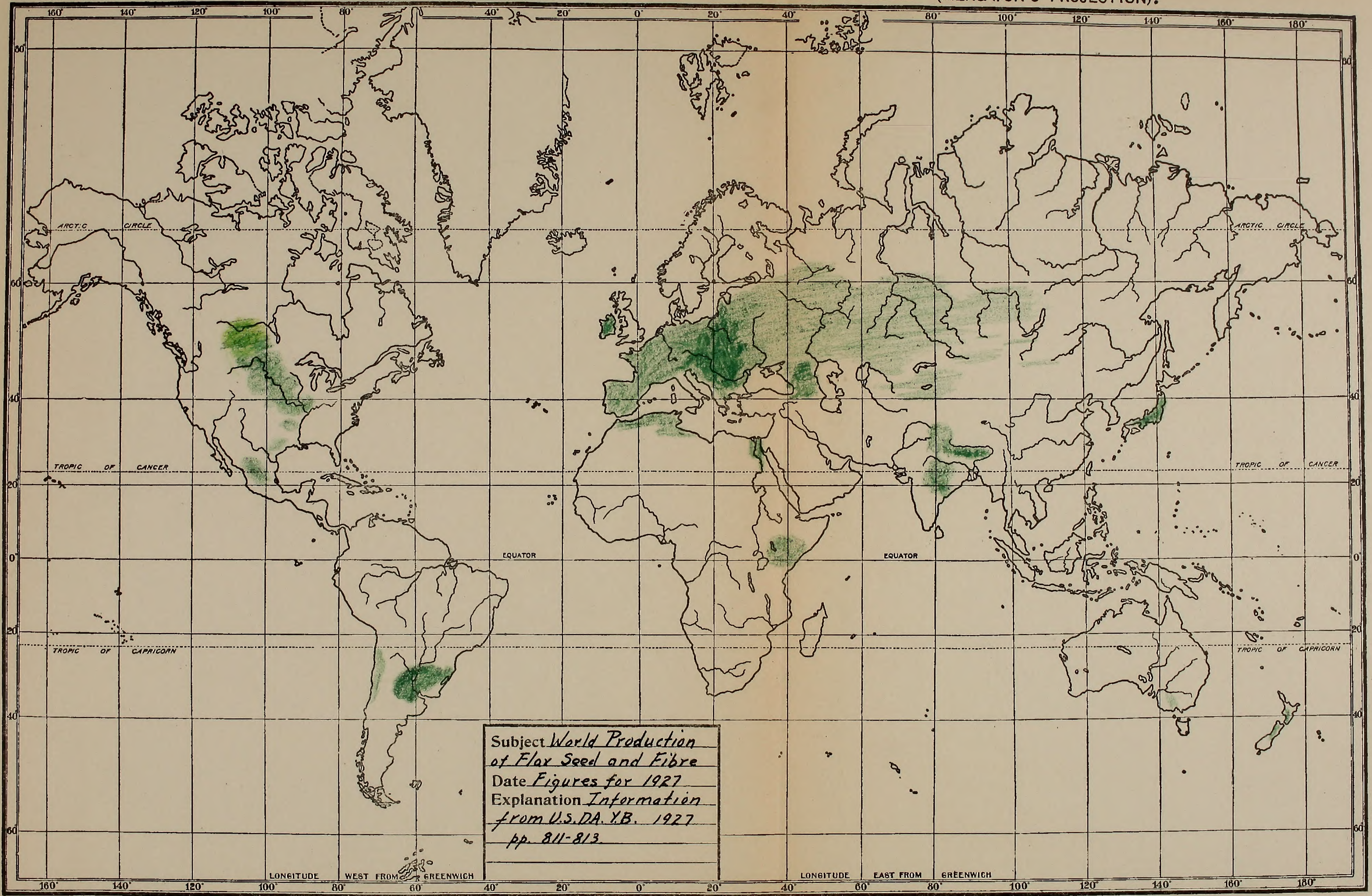
The United States produces about fifty percent of the world-supply of cotton, and it is the leading export of this country, especially to Great Britain with its great textile factories. According to the United States Department of Agriculture, taking the average for the three years, 1919-1921, the United States produced fifty-two percent of the world's cotton; China, nineteen percent; British India, eighteen percent; Egypt, five percent. The other six percent is scattered throughout the world. The world production of cotton in 1926-1927, was twenty-eight million bales.(1) Of this, the United States produced 17,977,000 bales; India, 4,162,000 bales; China, 1,584,000 bales; Egypt, 1,497,000 bales.

According to the educational chart of the United States Department of Agriculture, there are five principal commercial types of cotton. These are: First, Sea Island; second, Egyptian; third, upland -- long staple; fourth, upland -- short staple; fifth, Asiatic. These types are based upon the length of the cotton staple.(2) Sea Island cotton has a staple of two inches; Egyptian cotton, one and one-half to one and three-fourths inches; upland long-staple, one and one-fourth inches; upland short staple, one and one-sixteenth inches; Asiatic, about one inch. Each cotton fibre is a small, hair-like cell which determines the strength of the cotton. A strand of wool is about one-third as strong as the same sized cotton fibre.

(1) U.S.D.A.Y.B.,1927,pp-916-917.

(2) Industrial Geog.--Whitbeck--p-101.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. **THE WORLD** (MERCATOR'S PROJECTION).



Subject World Production of Flax Seed and Fibre
Date Figures for 1927
Explanation Information from U.S.D.A. Y.B. 1927 pp. 811-813.

Fig. 19

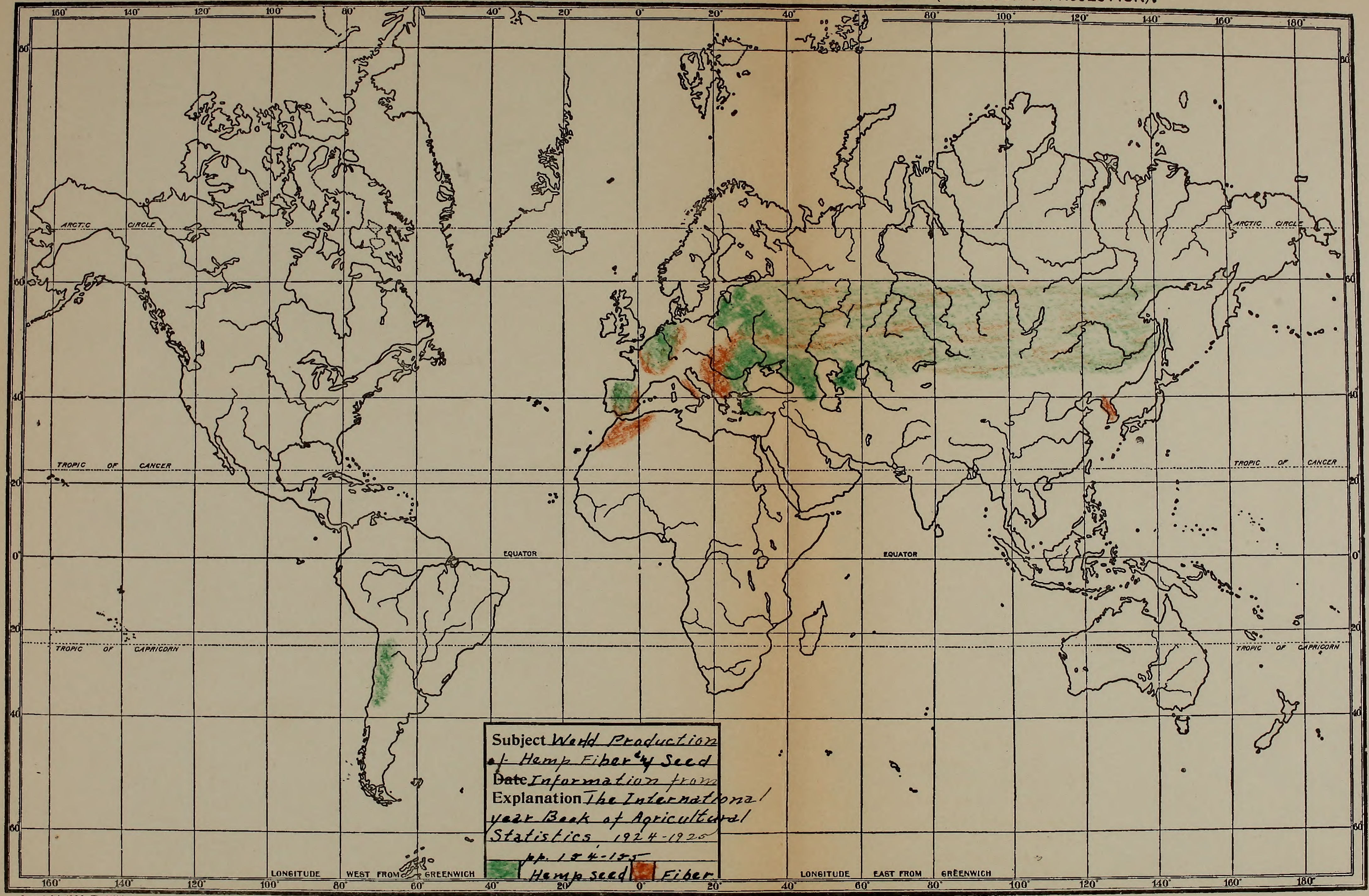
Besides cotton fibre, the seeds are also of considerable importance for they are made into cotton-seed oil, cotton-seed cake, and cotton-seed bread. Cotton-seed oil is practically identical in composition with olive oil, and therefore it is used as salad and cooking oil, in the manufacture of butter-substitutes, soaps, paints, and as a lubricant. Cotton-seed bread and cake are used as feed for live stock; cotton-seed hulls are used in the manufacture of paper, fibre board, and dairy feeds. In all, the cotton fibre is the most valuable part of the crop, although these by-products represent a considerable portion of the total value.

FLAX

The world-production of flax seed is approximately 150-million bushels annually, while that of fibre is approximately(1) 1,400,000,000 pounds annually. Although the United States is one of the largest consumers of linen, we import practically all that we consume. We do not raise the fibre here, because we have not the low-priced labor which determines where it can be raised, rather than suitable land and climate, but in Russia and Poland they do have low-priced laborers who are experienced in the necessary handling, retting, etc. The United States can increase its production of flax seed, as the growing demand for linseed oil makes this desirable, because we have the land and necessary machinery. It would be impossible for our high-priced labor to compete in the production of flax for fibre, when we can import it as

(1) U.S.D.A.Y.B.,1927, p-813.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject World Production of Hemp Fiber & Seed
Date Information from
Explanation The International year Book of Agricultural Statistics 1924-1925 pp. 154-155

🟩 Hemp seed 🟥 Fiber

Fig. 20

cheaply as we do.

Linen has always been a popular commodity, and as the world increases in population, the demand for linen is bound to increase also; so, by enlarged production in the areas where these skilled hand-laborers are now found, the world will not want for the linen which it needs.

HEMP

Hemp is an important fibre plant. It is much coarser than flax, and is, therefore, used as a substitute for linen. This is another case where the conditions are right for growing the product in the United States, but where it is actually grown to a limited extent, because of the lack of cheap labor which is necessary in the growing and preparing of it. The plant itself may reach a height of ten or more feet under favorable circumstances. The finest grades of hemp come from Italy, and because the male plants yield the best fibres, they are always cut before the female. Hemp of the best quality is creamy-white in color, soft and pliable, and it is largely used for cordage, ropes, and the carpet and rug trade.

Hemp seed is oleaginous and demulcent, and is used for feeding birds. When the seeds are submitted to pressure, they yield about twenty-five percent of a fixed oil which is used for making varnishes.

The hemp plant, especially in the warmer regions of the East, produces a resinous substance, some of which is used because of its narcotic virtues.

Chart III

NAME	NATIVE SOURCE	SOIL	RAINFALL	TEMPERATURE AND HUMIDITY.	ZONE	GROWING SEASON	IRRIGATION CROP	LABOR REQUIREMENTS.	ENEMIES	AVERAGE YIELD PER ACRE	LEADING COUNTRY IN WORLD PRODUCTION	YIELD OF LEADING COUNTRY.	SECOND LEADING IN WORLD PRODUCTION.	YIELD OF SECOND LEADING COUNTRY.	USES OF CROPS.	GENERAL CONSIDERATION
FIBERS CONT.																
JUTE	Evidently a native of India. (1)	Wet soil, grown chiefly in the delto of the Ganges. (2)	About 75 inches	Hot climate and damp. (2)	Sub-equatorial Zone.	3 months after planting. (3)	Yes, but not required.	Cheap and abundant labor required.	Weeds. After first weeding it grows itself. (5)	India leads with (1924) 13.1 q.q. Formoso (1925) 14.2 Japan (1922) 16.7 per hectare. Internat. Y. B. of Agr. Stat. 1924-25 pp 162-163.	India (1924)	14,489,559 quintaux quintals. 4,092,000,000-lbs. (1927-28) (5)	Nepal	104,646 q.q.	Burlap, bags, etc. (4)	The bags that sugar, coffee, grain, etc. come in are of Jute.
SISAL	Native of South America and Yucatan (1)	Does well on most stony, dry soils, but requires, for its best development limestone soil (2)	40-50 inches	Warm with wet and dry seasons. (3)	Subequatorial Zone.	Outer leaves cut at end of third year or fourth. Cutting lasts 25 years per plant (3)	No.	Cheap labor. Little labor outside of planting and cultivating.	Fire is the greatest.	15 leaves per year per plant in Yucatan (2) 1000-1500 lbs per acre. (4)	Mexico. (Yucatan) (1927)	678,000 bales (exported) (5)	Hawaii (1919)	1,802,000-lbs. (6)	Ropes and cords; binder twine (3)	Increase in use, since the use of the binder in the wheat fields.
MANILLA HEMP	Found in the Philippines, where it is now raised. (1)	Volcanic soil, not too wet nor too dry. (2)	50-125 inches (6)	Relatively high humidity desired. (3)	Subequatorial Zone.	Plants take (4) from 3-5 years to mature, depending on whether suckers or seedling.	No	Cheap labor. Most difficult problem is to keep the supply of labor. (7)	Enemies few. Insects not feared. Severe winds, drought, wild pigs, deer (5)	Philippines 4.1 q.q. per hectare. Internat. Y.B. of Agr. Stat 1924-25 pp 162-163.	Philippine Islands (1924)	1,976,850 quintaux quintals			Wrapping twine, fish lines, carpet warp. (8)	Next to sisal the most important fiber brought into U.S. (9)
MISCELLANEOUS CROPS.																
WHITE POTATOES.	Native of South America. Discovered in Chili in 16th Century (1)	Deep, mellow, free working loam, either of clay, silter sandy nature. Light soil for early Potatoes. (2)	20-50 inches normally.	Cool, moderately moist summers. (5)	Temperate Zone.	2-5 months	May be used where necessary. (3)	Extra labor required at harvest time.	Leaf blight, early and late blight, scab, rust, potato beetle, flea beetle. (4)	Malta leads with 262.2 bu. Ireland next with 252.9 bu. United States 114.7 bu.	Russia (1928) Germany (1927) U.S.D.A. Y.B. 1927 pp. 885-888.	2,009,149,000 bushels (6) 1,379,712,000 bushels	Poland (1927)	1,166,638,000 bushels	Food starch	One of the chief food commodities of Central Europe.
SOY BEANS	Developed from a wild plant, growing in Japan and Manchuria. A vine not a bush as the present bean is. (1)	Adapted to a wide range of soils, (2) especially sandy soils. Best results are mellow, fertile, (7) sandy or clay loams.	10-50 inches	Hot weather plants. Will do well in either humid or dry climates. (4)	Temperate Zone.	About 120 days (6)	No.	No special labor requirements.	Few insect or fungus enemies. Rabbits most troublesome. Root knot and cow pea wilt. (8)	Manchuria has 22 bu., Japan 16.46 bu. (11) United States 12-40 bu. (7)	Manchuria (1922) China (1927)	149,160,000 bu. (9) 5,000,000 tons (11)	Japan	18,163,000 bushels. (average 1917-1919) (10)	Human and animal food. Oil for paint. Soil conditioner. (5)	Bean rich in protein, so is a substitute for lean meat. (3)
TOBACCO	Native of America of specie Nicotina. Not known in Old World (1) before Columbus.	Deep, rich sandy loam. (2)	20 inches or more. Tropical tobacco has abundant rainfall.	Varies according to type of tobacco and place where grown. (3)	Subequatorial, Subtropical, and Temperate Zones.	About 4 months after plants are set out in the field.	May be.	Planting and harvesting require most of the labor.	Rust, spotted leaf, mosaic disease, flea beetle, cut worms, tobacco worms. (4)	Germany leads with 1,792 lbs. Belgium next with 1686-lbs. United States 769-lbs. U.S.D.A. Y.B. 1927 pp. 975-976.	United States (1927)	1,237,832,000-lbs.	Russia (5) 1928 Japan 1927	348,552,000 pounds 147,986,000 pounds.	Smoking Chewing Insecticide.	Type, character and commercial value of leaf largely dependent on character of soil
RUBBER	Used originally as wild rubber from the forest, in countries where now found.	Fine sandy to silty clay; fine sand with clay subsoil. Rich forest soil of good physical texture. (1)	70 inches ample, provided fairly distributed. Parts of India have (2) 150-200 inches.	Warm and moist. (3)	Equatorial and Subequatorial Zone.	Comes from trees, which yield when trees are 5-6 years old. (4)	No	Requires abundant labor. Chinese and Malayan Indians used. Wages (5) cheap. 37-80¢ daily	Pink, and leaf diseases, South Indian fungus, canker, root disease. (6)	Ceylon leads (7) with 374-lbs. (1922) Cochin China next with 328 lbs (8) Malaya 324 lbs (9)	Malaya Includes Federated Malay States, ports of Burma and Siam.	448,000,000 lbs (1922) (10)	Dutch India Includes islands of Java, Madura, Sumatra, Borneo & small isles	159,090,755-lbs (1922) (11)	Auto tires, tubes; and all sorts of rubber goods.	Most rubber is now plantation rubber.
COCOANUTS	Probably native of the south-eastern part of Asia.	Best is alluvial loam. Light sandy soil, deep welldrained, with much humus is desirable. (1)	60-75 inches mean monthly rainfall. (3)	Average temperature at 80°F. Average humidity 76-78 (2)	Equatorial and Sub-equatorial Zone.	Comes from trees, that may bear 100 years. (4)	No	Cheap labor is necessary. Rice takes much of the available labor. (5)	Budrot, root disease, stem bleeding disease, leaf disease; scale, mealy (6) bug, white fly.	Nuts per tree 32-72 (1920-26), per acre 1400-2600. Pounds of copra per acre 761-1214 (7)	Total copra Philippine Islands Used as copra Dutch East Indies Used for Oil. Philippine Islands	775,428,915-lbs (1922) (10) 748,383,326-lbs (1922) (8) 236,351,178-lbs. (1922) (8)	Dutch East Indies Philippine Islands Ceylan	754,470,319-lbs (1922) (8) 381,510,285-lbs (1922) (8) 62,118,112-lbs (1922) (8)	Food. Oil used for food, soap stock, in margarine & lard mixture. (9)	In 1923 had 811,600,000 lbs of copra; and 228,336,000-lbs cocoanut oil. in Philippines. (10)
PEANUTS.	Believed that cultivated peanuts originated in S. America, perhaps. In Africa. (1)	Sandy loam, well drained, open sub-soil, and abundance of lime. (2)	Light rainfall (4) during growing season. Dry at harvest time. 25-50 inches. (3)	Free from frost. Bright, sunshiny weather desirable (5)	Temperate. Subequatorial and Subtropical Zones.	100-150 days without frost, according to variety. (6)	No	No special requirements where machinery is used. Hand labor is expensive.	Insects in storage and leaf spot chief enemies. (7)	In United States 715.4 pounds per acre in 1927 U.S.D.A. Y.B. 1927 pp 947-950	China (1927) Senegal (Africa)	1,200,000,000 pounds raised. 1,066,899,000 pounds exported (1926)	British India	994,900,000 pounds export 1926	Food in form of nuts and butter; peanut oil used extensively. 8	Peanuts should generally follow a crop giving clean culture as cotton or corn (9)

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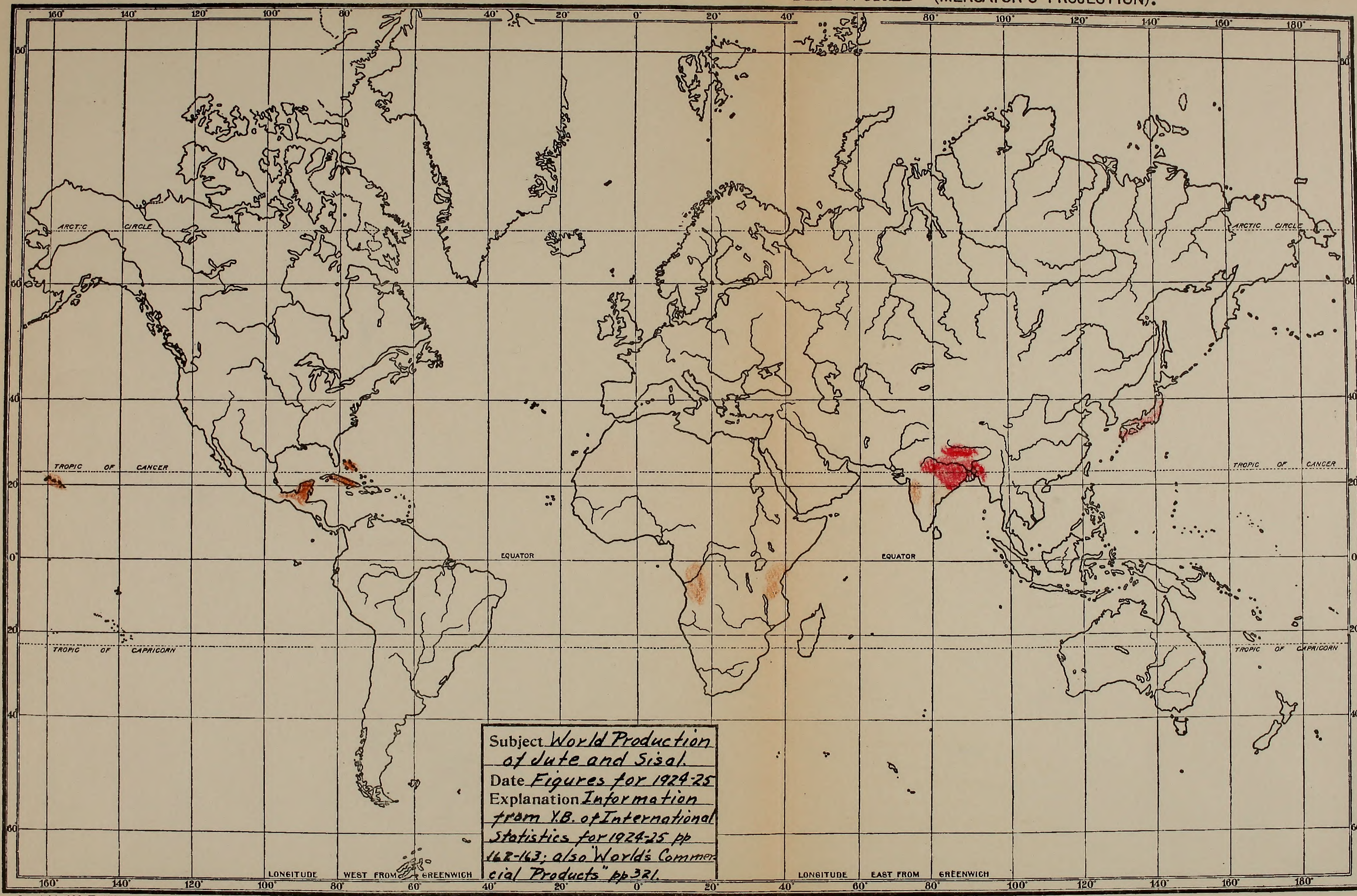

Subject World Production of Jute and Sisal.
Date Figures for 1924-25
Explanation Information from Y.B. of International Statistics for 1924-25 pp 162-163; also "World's Commercial Products" pp 321.

🟥 Jute Sisal 🟧

Fig. 21.

JUTE

There are numerous varieties of jute, but the yield of fibre is quite similar for each of these varieties. India produces most of the jute of the world, amounting to about four-billion pounds yearly.(1) This is raised in the lower Ganges valley where the delta soil, and the hot climate, seem to be highly suited to the growth of this crop. The fibre is taken from the inner bark of the jute plant, and is used in making coarse cloth, as burlap. Jute bags are shipped all over the world as containers of coffee, sugar, cotton, nitrate of soda, etc.

SISAL

The principal part of the world where sisal, or henequen, is grown, is the peninsula of Yucatan in Mexico. It is also grown in the Bahamas, Florida, Cuba, Hawaii, and parts of British East Africa, with satisfactory results. The long sword-shaped leaves of the plant, armed with thorns along the edge, yield the fibre. In Yucatan about an average of fifteen leaves per plant is obtained for twenty-five years. At the end of that time, the plants send out a flowering stem, after which they die. Sisal is smooth, straight, and clean; is yellowish-white in color, and about two and one-half to four feet long. Next to Manila hemp, this is the most important fibre for use in cordage. Since the development of the binder for use in the wheat fields, sisal has been used almost exclusively for binder twines.

(1) Y.B. of Commerce, 1928, p-332.

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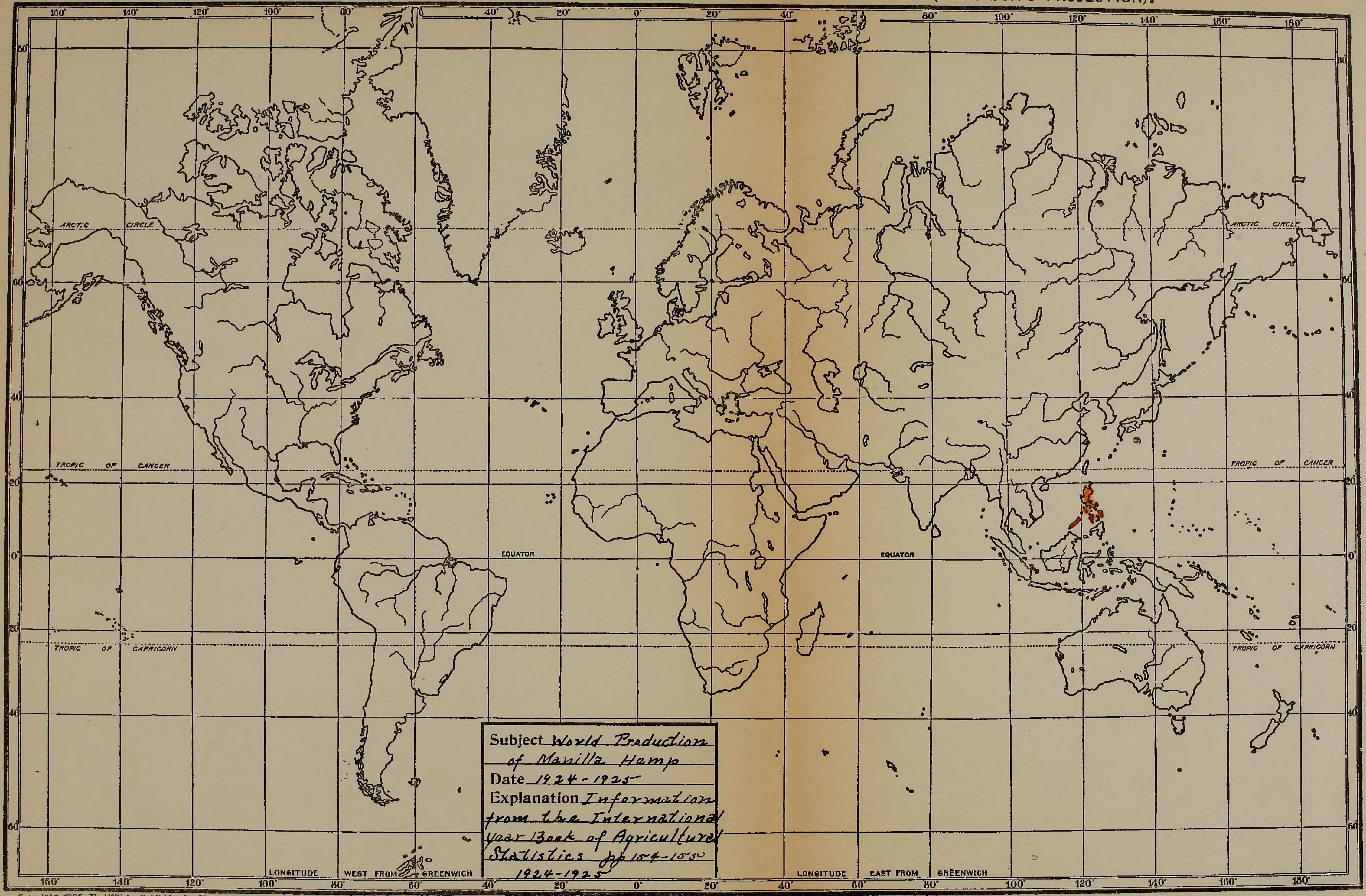

Subject *World Production of Manilla Hemp*

Date *1924-1925*

Explanation *Information from the International Year Book of Agricultural Statistics pp 154-155 1924-1925*

Fig. 22

McKinley's Desk Outline Maps. [illegible]

Subject [illegible]
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Explanation [illegible]
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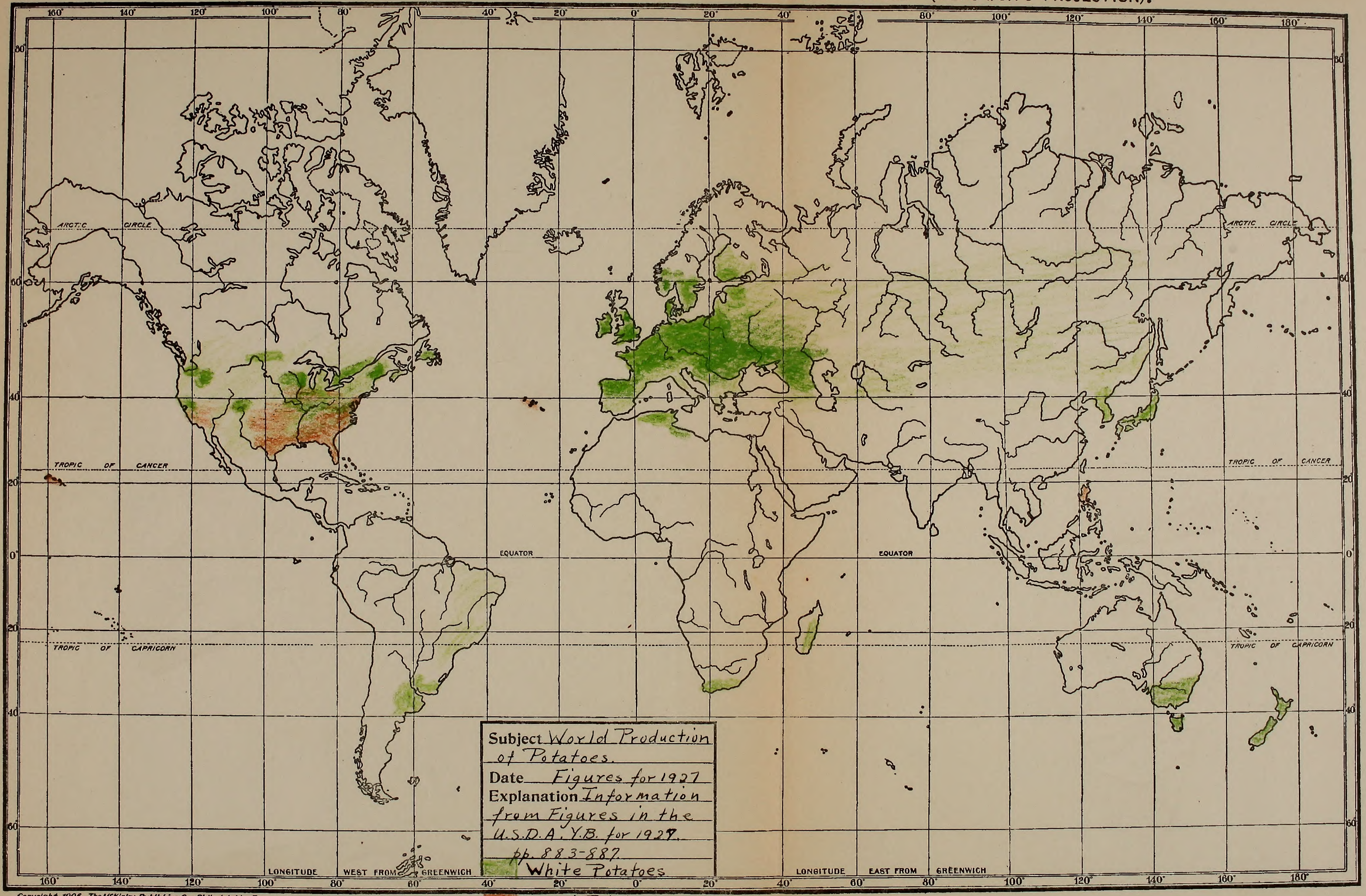

Subject World Production of Potatoes.
Date Figures for 1927
Explanation Information from Figures in the U.S.D.A. Y.B. for 1927. pp. 883-887

🟩 White Potatoes

🟧 Sweet Potatoes pp. 896

Fig 23.

MANILA HEMP

Manila hemp of the Philippines is really not a hemp at all, but a fibre which is a relative of the banana plant. It is cultivated only in the Philippines where it is one of their foremost industries. The finest grades of Manila hemp are of a light buff color, lustrous, very strong, with strands from six to twelve feet in length. The inferior qualities are much coarser, and have not the strength of the finer grades. Manila hemp is supreme for rope making.

WHITE POTATOES

As a food the potato ranks third in the world, along with wheat and rice. The value of potato is in the fact that it can store up starch, which is one of the chief kinds of human food. Another important feature is that so much food can be grown in so little ground, for no other crop, unless it is corn, can produce as much food per acre. Because of this, it is suited to areas of dense population as an inexpensive food. Such countries as Germany, Russia, Poland, Holland, Belgium, etc., have soils and climates suitable for the growing of potatoes, and therefore, we have an enormous growth of this inexpensive food to feed those large populations. They also use potatoes to feed farm animals, especially cattle and hogs, in place of corn. In Europe the potato is made into starch, flour, and alcohol.

World production amounts to nearly six-billion bushels -- the statistics of production in Russia, China, and India, for

(1) U.S.D.A.Y.B., 1927, pp-885,-887.

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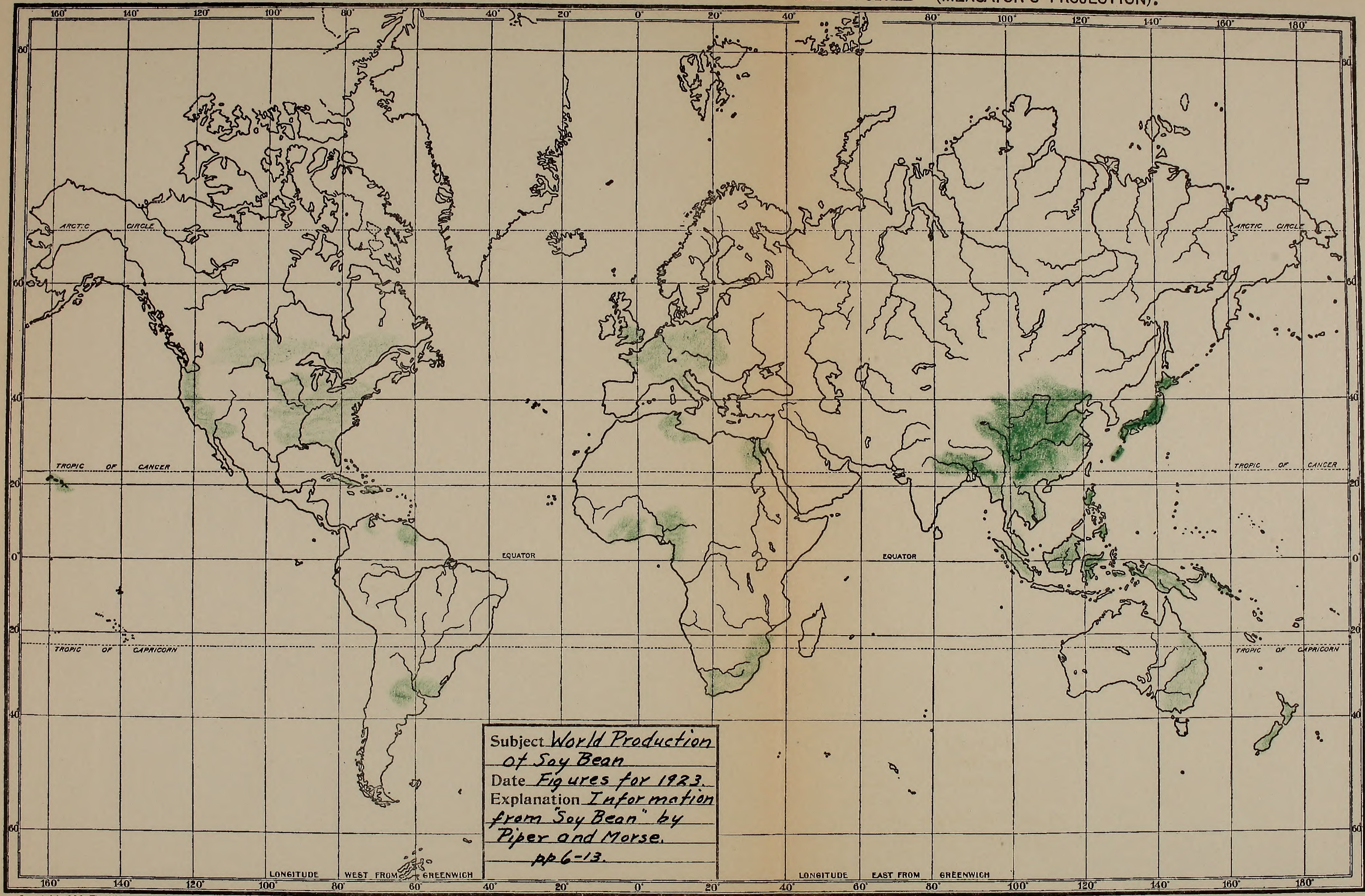


Subject World Production of Soy Bean
Date Figures for 1923.
Explanation Information from "Soy Bean" by Piper and Morse. pp 6-13.

Fig. 24.

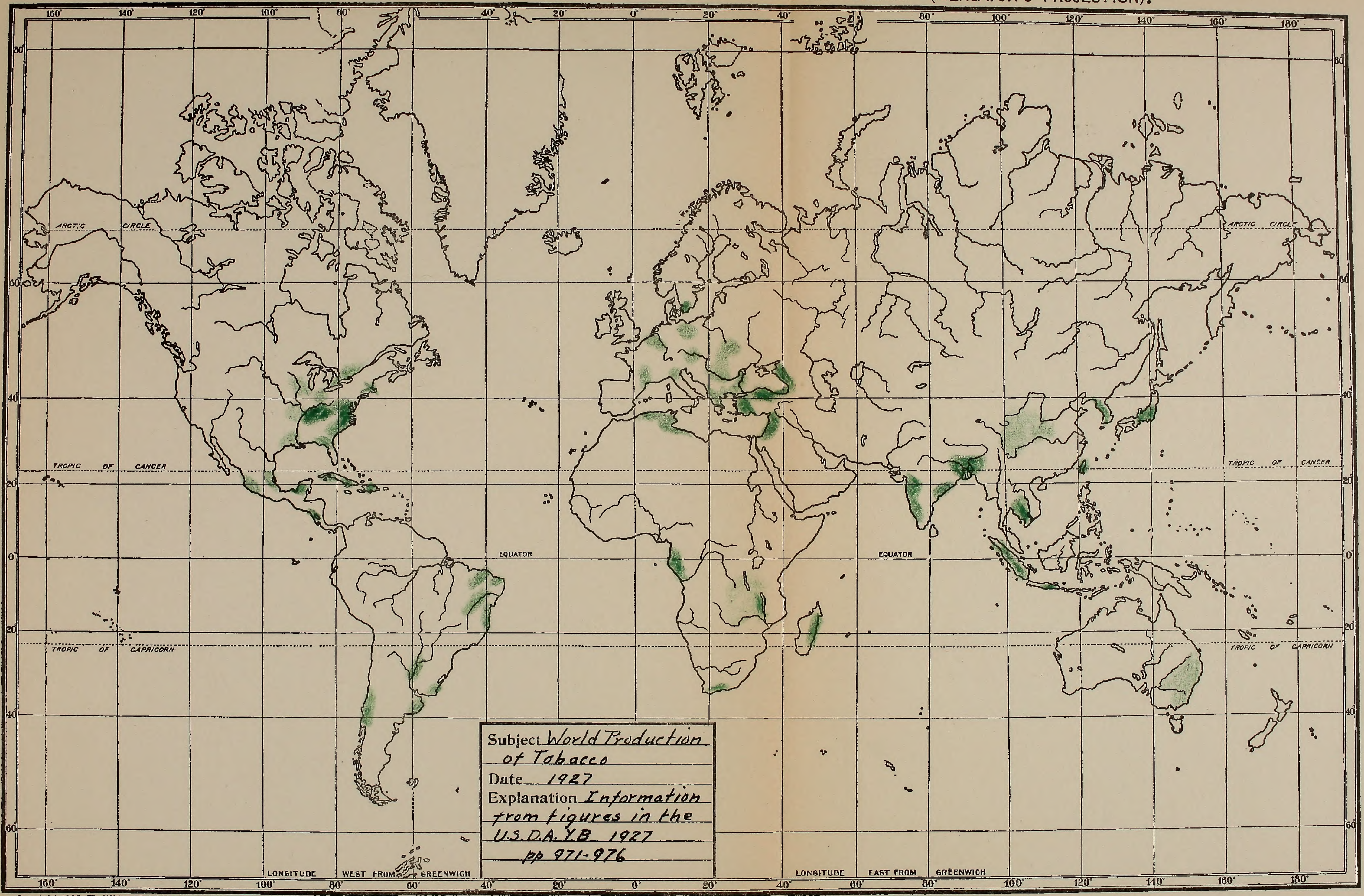
recent years, being so uncertain that accurate figures are not available. On the basis of years 1924 and 1925, European Russia probably produces more potatoes than any other country; but figures for 1926 and 1927 are unknown, so its place cannot be definitely defined.

Some people have claimed, because of the use of the tuber for seed, the potato itself will run out, and if this is possible, it will be necessary to develop new varieties from the true seed of the potato plant. Since so many millions depend upon this food, it is not likely that the potato will be allowed to become neglected.

SOY BEANS

Soy beans are a legume like other beans grown in the United States, and as such, take nitrogen from the air and fix it in the form of nodules on its roots while it grows. That is one reason for its increasing use in America. In the Orient, where China is the largest producer, because soy beans can be utilized in so many ways, it is one of the principal foods of the East. It is rich in oil, can be crushed into cakes, made into milk, as well as be used in the many ways in which beans are used in this country. Because of its ease of growing, the fair yield per acre, and because of its wide adaptibility as far as soil and climate are concerned, with very few enemies, it has become a most desirable food for the Oriental people, and other countries in the world are beginning to see its advantages.

McKinley's Desk Outline Maps. Double Size. No. 100a. THE WORLD (Mercator's Projection).



Subject World Production of Tobacco

Date 1927

Explanation Information from figures in the U.S.D.A. Y.B. 1927 pp 971-976

Fig. 25

TOBACCO

Ever since the days of the introduction of tobacco into England by the explorers of America, its growth has developed, until now there is almost a passionate demand for it the world over. To-day we have a world-production of about four-billion pounds annually.(1) In the United States there are six classes of tobacco grown. Three of these are for cigars; the filler class, the binder class, and the wrapper class. The other classes are distinguished according to the manner of curing, and are the flue-cured, the fire-cured, and the air-cured.(2) The cigar types of tobacco are grown in the states of Georgia and Florida, and north of the Ohio river in Maryland, and the other four-fifths is grown for chewing, smoking, snuff, and exports. In parts of the country,"tenting" is carried on which makes a finer grade of tobacco, and a somewhat better yield, although the expense is greater than for the ordinary field-grown tobacco.

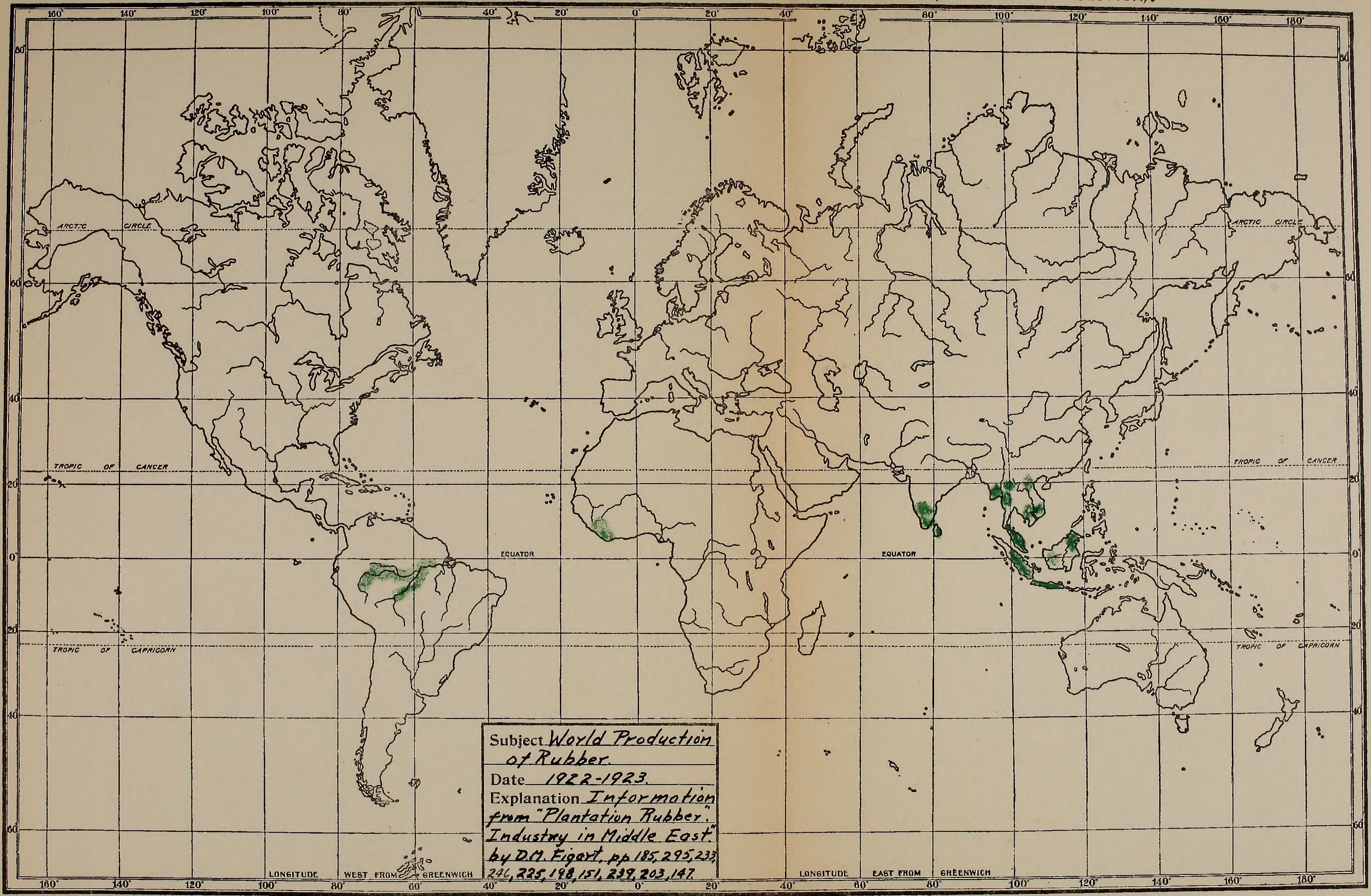
RUBBER

Rubber is one of the most important of the world's commodities in trade. Since the development of the automobile industry, there has been an increasing demand for this particular product. Years ago, when the demand for

(1) U.S.D.A.Y.B.,1927, pp-972-976.

(2) U.S.D.A.Y.B.,1927, pp-972-976.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject World Production of Rubber.

Date 1922-1923.

Explanation Information from "Plantation Rubber. Industry in Middle East" by D.M. Figart. pp 185, 295, 233, 246, 225, 198, 151, 239, 203, 147.

Also Industrial Geography by Whitbeck. p 327
Fig. 26

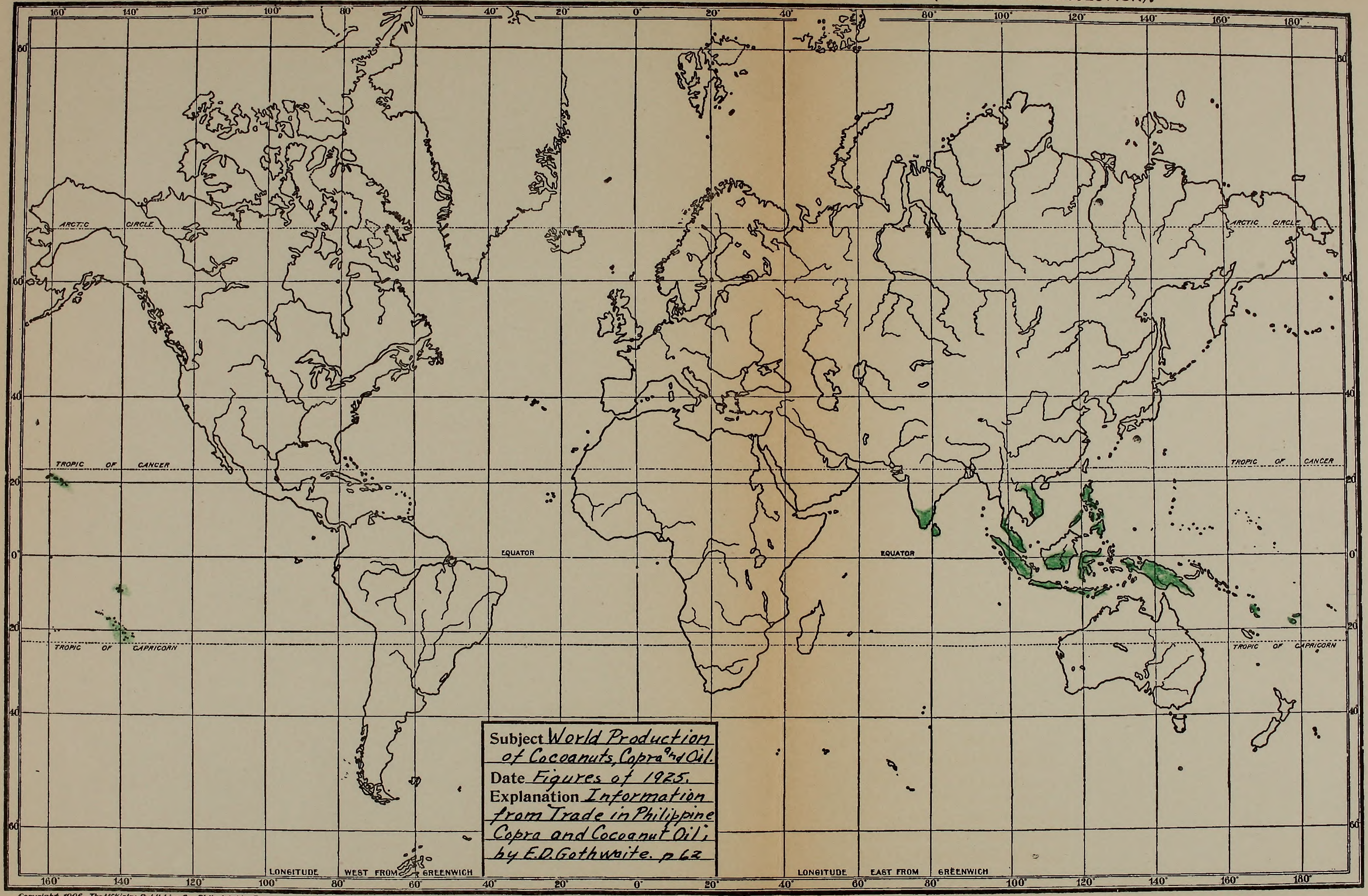
rubber was slight, the world was satisfied with the wild rubber of the rainforests. Twenty-five years ago, Brazil was producing over fifty-percent of the world's rubber supply from the wild rubber trees of the Amazon forests. The Indians used to tap the trees and collect the latex, curing it over fires of palm nuts in their camps along the rivers. Manaos was then the great interior rubber market of Brazil, being located half-way up the Amazon river, but to-day, with the increasing demand, has come the development of plantation rubber. In 1923, about ninety-percent of the world's rubber came from this source, and only ten-percent from wild rubber.(1)

The jungles of the equatorial and tropical regions are cleared of trees and brush, and the small rubber trees are set out in plantation arrangement. The latex cannot be extracted until the trees are five or six years of age, when they are tapped almost daily. The latex is separated from the water by a chemical process, and then it is ready for shipment.

Most of the rubber plantations have European owners, particularly the British, who, because of their control of the rubber market, are causing the development of American-owned plantations for American consumption. America, the greatest consumer of rubber, naturally does not desire British control of this industry, and Mr. Firestone is

(1) Industrial Geog.,R.H.Whitbeck, p-496.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject *World Production of Cocoanuts, Copra and Oil.*

Date *Figures of 1925.*

Explanation *Information from Trade in Philippine Copra and Cocoanut Oil; by E.D. Gothwaite. p 62*

Fig. 27.

establishing a million-acre rubber plantation in Liberia, which he hopes will supply his needs for the manufacture of automobile tires. Mr. Thomas Edison is now experimenting in Florida with other plants than rubber plants, in the hope of producing rubber from other sources more economically, as there are several other plants which produce a rubber-like fluid.

The principal countries producing rubber are Java, Madura, Sumatra, Borneo and other Dutch Indian provinces, as well as India, Burma, Malaya, Cochin-China, British Borneo, Ceylon, Fiji Islands, Hawaii, etc.(1) In these countries cheap labor is abundant, climatic conditions highly desirable, and the facilities for carrying on the rubber industry very attractive. In Malaya they depend upon the Chinese labor, and it is interesting to note that labor near the coast is cheaper than that which is inland. Mr. Figart predicts that there will be a slight increase in the production of plantation-rubber up to 1930.

COCOANUTS

Cocoanuts are sold in three different ways: First, as the whole, raw cocoanut; second, as copra, which is the dried meat of the cocoanut; third, as cocoanut-oil. Most of the world-trade is in cocoanut-oil. The Philippines and the Dutch East Indies specialize in copra, whereas the Philippines produce almost as much oil as copra. According to the figures of 1923,

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(1) "Plant and Rubber Industry in the Middle East" -- D.M.Figart, pp-253-295.

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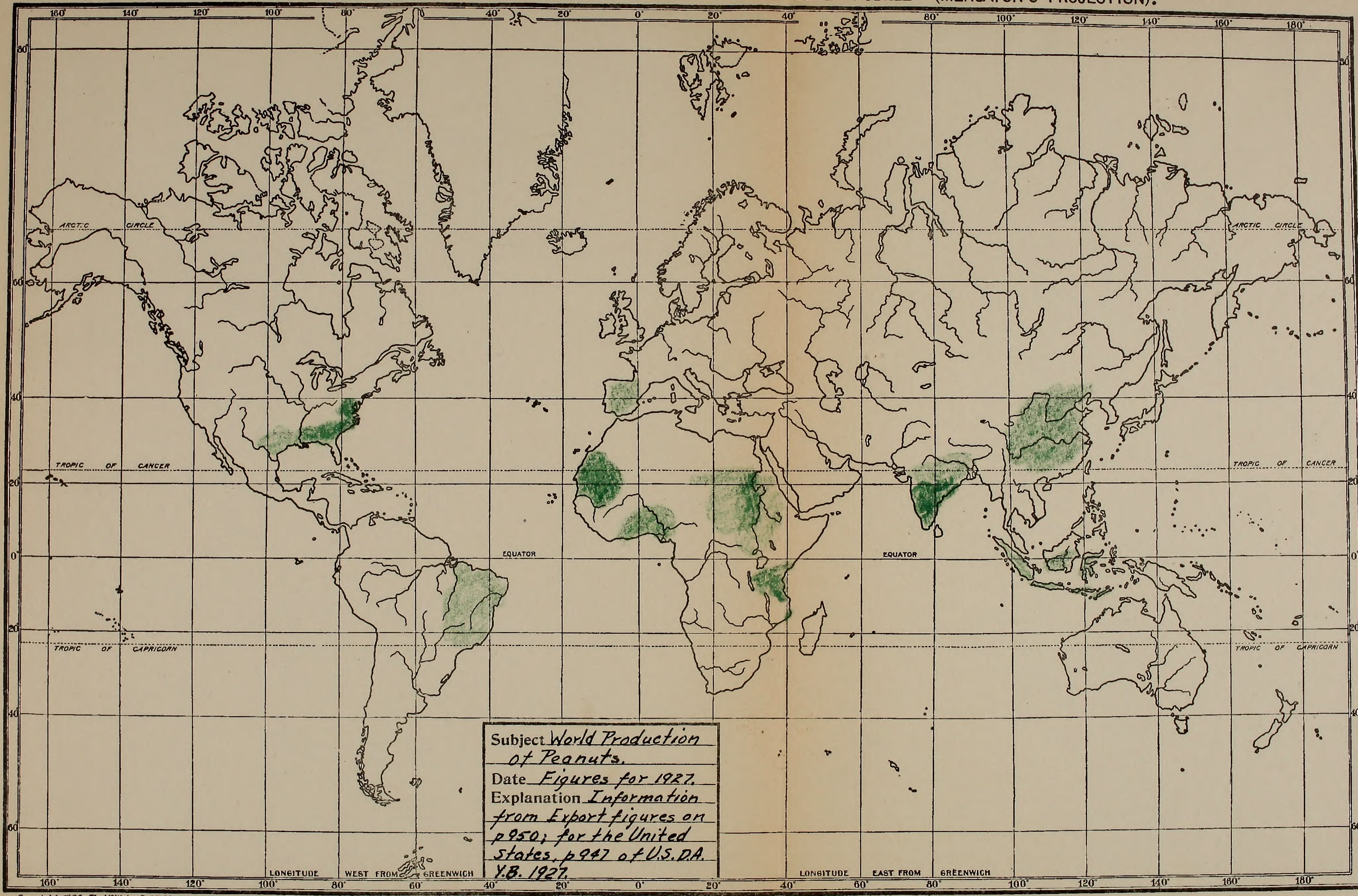


Subject *World Production of Peanuts.*
Date *Figures for 1927.*
Explanation *Information from Export figures on p950; for the United States, p947 of U.S.D.A. Y.B. 1927.*

Fig. 28

the Philippines produced about twenty-million pounds more copra than the Dutch East Indies, out of the theoretical total copra exports,(1) and other sections producing copra are Ceylon, Strait Settlements, India, Indo-China, and Oceania. According to Mr. Gothwaite, the cocoanut-oil industry of the Philippines "depends upon the United States' market which must be maintained".(2) Labor is absolutely necessary, and the extra labor in the Philippines is now being utilixed by the rice production, so that a steady staff of laborers can be kept to carry on the copra industry.

Cocoanut trees will bear for about one-hundred years, according to estimate, so that once a tree is established, it can be depended upon to produce for about that length of time under favorable conditions. It has been predicted by Mr. Gothwaite that there will be a slight increase of production in the Philippines for the next few years, owing to the increasing demand in the United States for vegetable oils, of which cocoanut-oil is one.

PEANUTS

Peanuts, as a crop, are growing in favor in the United States. China and Senegal, on the west coast of Africa, lead the world in their production; India, also, produces large quantities. The advantage of peanuts as a source of highly nutritious food, and the ability to be made into butter as well as into oil, plus cheapness of production, are making it

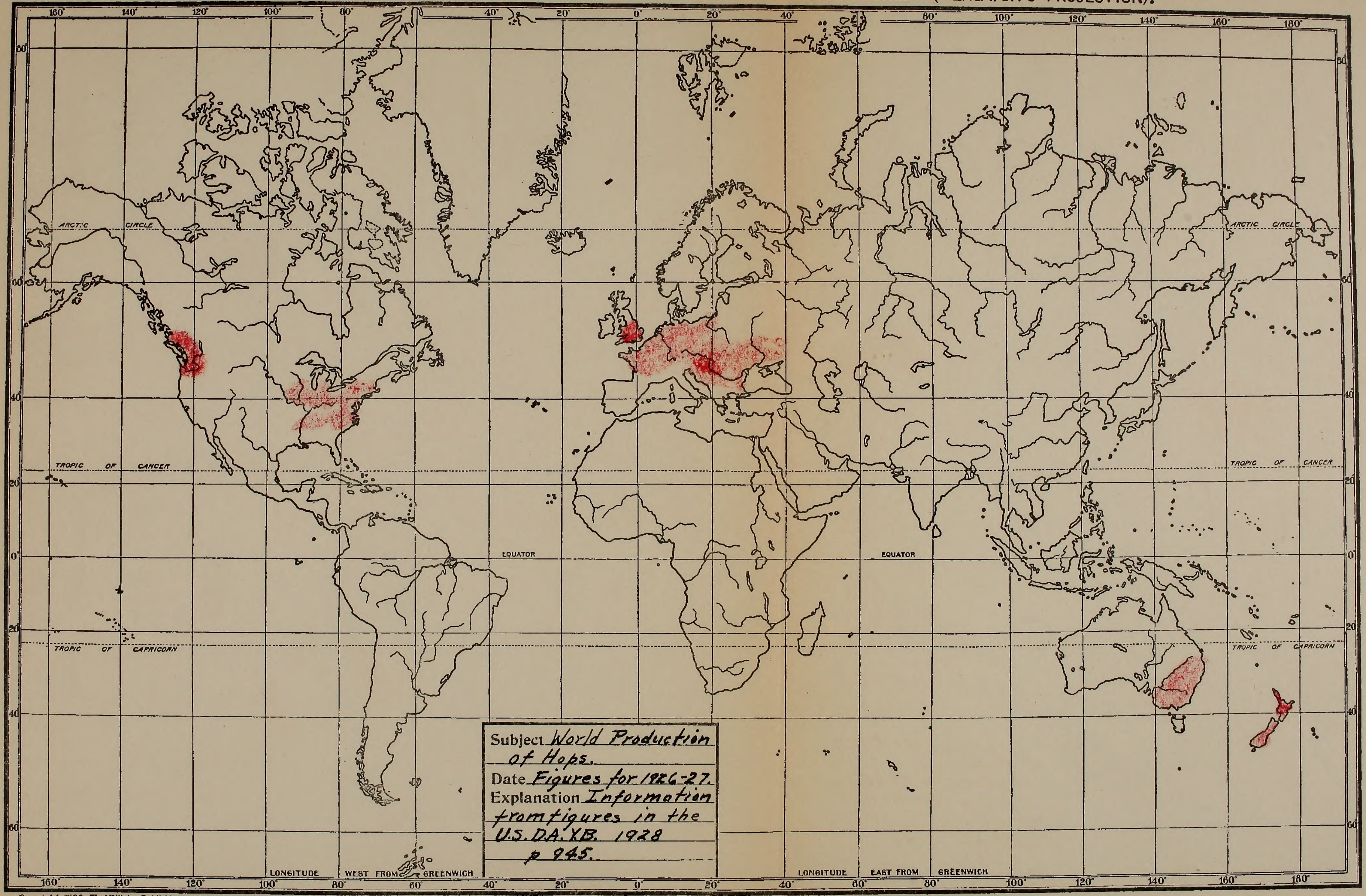
(1) "Trade in Phil. Copra & Cocoanut Oil"--Trade Promotion Series #11,p-62,Gothwaite.

(2) Trade Promotion Series #11, p-114,Gothwaite.

Chart IV

NAME	NATIVE SOURCE	SOIL	RAINFALL	TEMPERATURE AND HUMIDITY	ZONE	GROWING SEASON	IRRIGATION CROP	LABOR REQUIREMENTS	ENEMIES	AVERAGE YIELD PER ACRE	LEADING COUNTRY IN WORLDS PRODUCTION.	YIELD OF LEADING COUNTRY	SECOND LEADING COUNTRY OF WORLD PRODUCTION	YIELD OF SECOND LEADING COUNTRY	USES OF CROP	GENERAL CONSIDERATION
MISCELLANEOUS CROPS CONT.																
HOPS	Believed to be Native of America and England. (1.)	Rich alluvial land, or deep sandy, or gravelly loams preferred. (2)	20–50 Inches (5)	Mild regions, with abundant early rain followed by warm dry weather toward maturity (3)	Temperate Zone	Perennial vines. Not yielding until 2nd year, usually.	No	Handpicking is expensive and labor must be available at right time. (6)	Lice and mold result from damp weather near harvest. Long cold winters undesirable. (4)	Belgium leads with 1339 lbs United States 1211 England + Wales 1244 lbs.	United States U.S.D.A. Y.B. 1927	29,794,000 pounds Preliminary 1927	England + Wales p 945.	28,616,000 pounds	Stock for making beverages.	Drying and curing requires careful attention. (7)
SWEET POTATOES	American origin, Known and used before Irish potato was discoverd. (1)	Light, sandy loam, rich in organic matter. Heavy soils not desirable. (2)	Abundant during first half of growth somewhat dry weather as it matures. (3)	Warm and moist Conditions of south east U.S. quite favorable. (4)	South Temperate and subtropical, sub equatorial Zones.	About 4½ Months (5)	No.	Extra labor required at harvest time	Black rot, also other rot diseases; sweet potato borer. (7)	United States yields 100.9 bu. per Acre pp. 896	United States U.S.D.A. Y.B. 1927	93,928,000 bushels Preliminary 1927	Figures with other countries, as Central America, West Indies, Hawii and Phillipines, not Available (8)		Food	Perishable, so cannot be stored for a long time. (6)
FRUITS																
GRAPES	Wild forms found in Northern Hemisphere. Species found in Old and New World. (1)	May grow on a wide range of soils, if land is well drained, open to air and holds heat. gravelly loam (2)	Light summer rainfall 25-50 inches. (3)	Dry air desirable. (4)	Temperate Zone.	Perennial Vines. About 4-6 months.	No.	Common labor must be somewhat abundant for rush tasks such as tying and picking. (5)	Phylloxera, grape root worm, flea beetle, black rot, downy mildew. (6)	Yield per hectare Syria leads with 60,0 q.q. Bulgaria 55,0 Italy 34,0	Italy Internat. Y.B.	42,065.000 quintaux quintals. of Agr. Stat.	Spain 1924-1925	37.710.797 quintaux quintals pp. 136-137	Food Raisins	Important fruit of temperate zone.
GRAPES FOR WINE	Cultivation of grape in Old world probably began about the Caspian Sea (1.)	Will not thrive on sandy soils unless well mixed with clay humus, and a clay subsoil. Light gravelly loam (2)	25-50 inches	Damp, cloudy days are injurious to the grape during the growing season. (4)	Temperate and Subtropical Zones.	Perennial Vines. About 4-6 months.	No	Skilled labor required to cultivate the vine. Where grapes abound expert labor is found. (5)	Phylloxera, thrips, powdery mildew. (6)	Yield per hectare Luxemborg 81,5 hectolitres Algeria 50,0 France 42,5	France Internat. Y.B.	67.948.569 hectolitres of Agr. Stat.	Italy 1924-1925	26.464.000 hectolitres pp 136-137.	Wine	One of the leading industries of Europe.
CITRUS FRUITS	Orange a Native of China; Lemon of China or India Lime of India Shaddock (Grape Fruit) of Malay Peninsula (1.)	Sandy loam preferred, deep and free from hard pan; well drained (2)	15-75 inches. (3)	Needs warm weather. Very sensitive to frosts. (4)	Tropical and Subtropical Zones. (5)	Perennial trees.	May be.	Careful and special handling required. Labor cost almost ½ cost of production in Col. (8)	Gum disease, scaly bark, die back, foot rot, etc.; black scale, red scale, mealy bug, red spider, etc (7)	Oranges in California for 1910-11, 156.6 boxes per acre. Lemons, 196.2 boxes per acre (6)	Oranges United States (1927) (9) Lemons Italy (1926) (10)	32,770,000 boxes produced 7,008,000 boxes exported	Spain (probably) (1926) (10) United States (1927) (9)	20,265,000 boxes exported. 6,400,000 boxes produced.	Food	Important fruit crop. Has future possibilities in the United States.
OLIVES	Native of Southern Europe and Asia Minor. (1.)	Prefer fertile, well drained loams. These may be sandy, gravelly or clay loams. (3)	Light rainfall. Up to 15 inches (6)	Mild climate. (2) Temperature below 28°F. may injure the crop. Dry rather than humid weather desired.	Subtropical Zone.	Perennial Tree.	May be as in California.	Harvesting very expensive where many pickings are necessary. Good pickers required. (4)	Black scale the most serious; olive knot the most destructive disease. (5)	At 20 years from 4-50, average near 15 gal. fruit per tree; of oil 1-10 gal. per tree (7)	Olive oil Spain Olives Spain Internat. Y.B.	3.351.894 quintaux quintals 17.447.803 quintaux quintals of Agr. Stat.	Italy Italy 1924-25	2.088.000 quintaux quintals 13.768.000 quintaux quintals pp. 138-139	Food.	Most of the olives are sold green, not ripe
APPLES	Original home unknown. Indiginous to region south of Caucasus. (1)	Fertile soil of good condition with previous subsoil adapted to the fruit to be grown (2)	10-75 inches	Warm days with cool nights. Rainfall well distributed thru season.	Temperate Zone.	From 4-7 months. 2-3 months of frost for some apples	May be.	Harvesting and packing require extra labor.	Apple scab, fungus, rust, canker; aphis scale, bud moth, tent caterpillar (3)	For U.S. (1912) about 1 bu. per tree, or 70-75 barrels per acre. (4)	United States (1927) U.S.D.A. Y.B. 1927.	77,700,000 bushels.	Canada (probably) (1918) p 833	8,920,000 bushels. (5)	Food	Very popular fruit in the United States.
DATES	Native of dry hot regions of North Africa. (1.)	Prevailing sandy soil; some varieties grow in clay. Sandy loam is one of best. Good drainage necessary (2)	Very light rainfall, but desires considerable irrigation water. (3)	Intense summer heat, light rainfall. (4)	Tropical Zone	Perennial trees Crops ripen from June-September according to country. (5)	Yes. Grown in oases of desert where there is water	Picking, handling and packing require much labor.	Scale insects most troublesome. Fungus palm borer, locusts, rats. (6)	Individual trees produce 300-500 pounds of fruit (7)	Arabia, probably leading country. Persia (exports) (8)	No statistics available. 74,110,000-lbs (1926-27)	Algeria (exports) (9)	23,912,000 pounds.	Food for man and animals.	One of chief foods of Arabs.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. **THE WORLD** (MERCATOR'S PROJECTION).



Subject *World Production of Hops.*
Date *Figures for 1926-27.*
Explanation *Information from figures in the U.S.DA.YB. 1928 p 945.*

Fig. 29.

more desirable for people to utilize. Shelled peanuts contain from forty to fifty percent of a highly digestible oil that is comparable to olive oil for culinary purposes.(1)

Cake, which is the resultant of expelled oil, is ground and marketed as peanut meal, containing about thirty-five percent protein. Experimentation has shown that peanut proteins are among the highest in quality, and are highly digestible. The world-imports of peanuts in 1926 amounted to about three and one-half billion pounds.(2)

HOPS

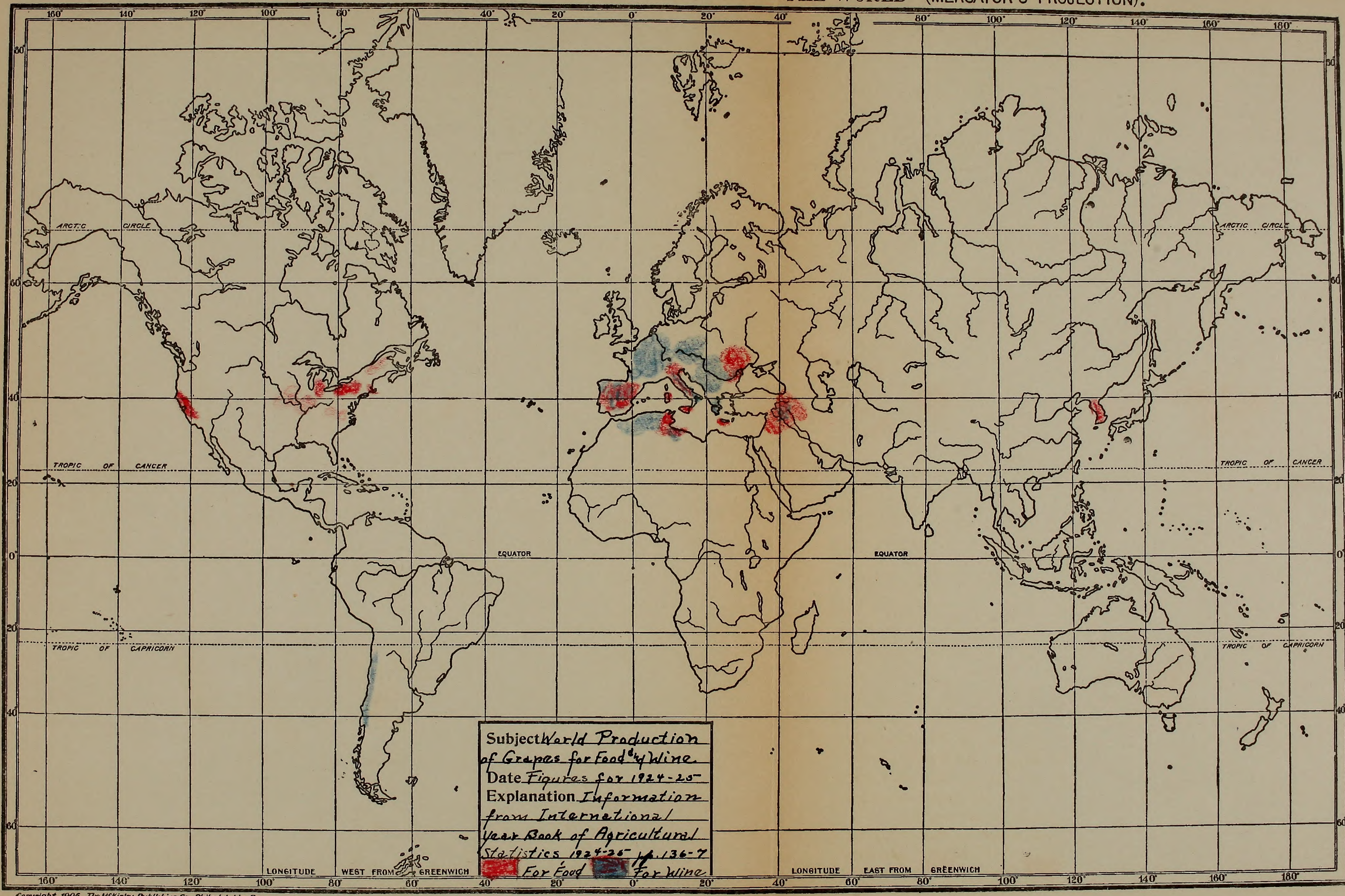
In 1927, the world production of hops amounted to about 120-million pounds.(3) The United States leads, with England and Wales ranking second. Other countries producing in considerable quantity, are Belgium, France, Germany, Czechoslovakia, Yugoslavia, Poland, and Russia. The crop is used as a substance in the production of beverages. In the United States, since prohibition, probably a large percentage of the hops grown are used in the homes for making "home brew".

SWEET POTATOES

Sweet potatoes are grown almost exclusively in the western hemisphere, with the exception of Hawaii and the Philippines. The difficulty with the sweet potato is its perishable nature, which prevents storage for any length of time, except cold-storage. Therefore, these potatoes are usually sold soon after they are dug. The sweet potato itself is very delicious; it is not hard to grow; the profit

(1) U.S.D.A.Y.B.,1927, p-503. (2) U.S.D.A.Y.B.,1927, p-950
(3) U.S.D.A.Y.B.,1927, p-945.

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. **THE WORLD** (MERCATOR'S PROJECTION).



Subject *World Production of Grapes for Food & Wine.*

Date *Figures for 1924-25*

Explanation *Information from International Year Book of Agricultural Statistics 1924-25 pp. 136-7*

🟥 *For Food* 🟦 *For Wine*

Fig. 30

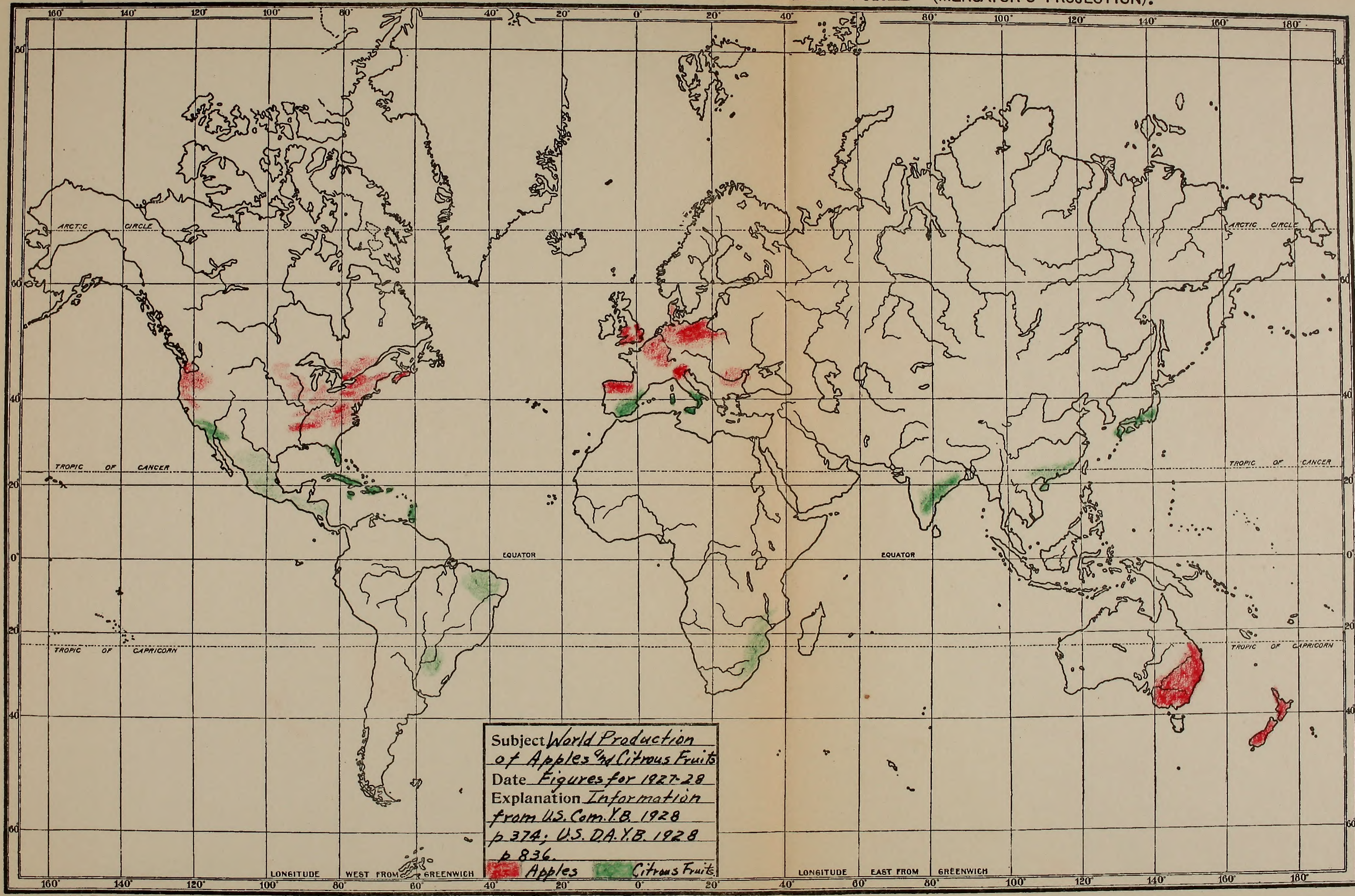
is usually quite satisfactory; but the sweet potato industry will increase only as the demand for this tuber increases.

GRAPES ----GRAPES FOR WINE

Grapes are raised principally in Europe for the use of wine. In the countries of France, Germany, Italy, Spain, and Portugal, beverages with grapes as their base, are the principal beverages. The wines produced in these countries are unsurpassed by any in the world. Each country, and different sections of the same country, has its individual brands of wine, each kind distinct from the other. In the new world, large vineyards are found in Chili, Uruguay, Peru, Bolivia, as well as the United States.

Some varieties of grapes are climbers, others are restrained by trellises. The terracing of the vineyards in Germany, Italy, etc., is done to a considerable extent, though other vines are raised in the open fields, or on the slopes, in order to give proper drainage and exposure. When the grapes are ripe, the harvest begins, and in the hotter districts the grapes are gathered before they are fully ripe, in order that the tartness may preserve the wine. In other sections the sugar and alcoholic content has to be preserved for the particular liqueurs that are to be made, as the grapes are picked when over-ripe. Other grapes are picked just as they are ripe, or possibly just a little before ripeness, for table use. In the United States great quantities are used for making grape-juice,

McKinley's Desk Outline Maps. Double Size. No. 100a. THE WORLD (MERCATOR'S PROJECTION).



Subject World Production of Apples and Citrous Fruits

Date Figures for 1927-28

Explanation Information from U.S. Com. Y.B. 1928 p. 374; U.S. D.A. Y.B. 1928 p 836.

🟥 Apples 🟩 Citrous Fruits

Fig. 31

a non-alcoholic beverage. Another use to which grapes are put is that of the manufacture of raisins, which are nothing more than dried grapes. The districts making raisins are restricted to California, near Malaga and Valencia in Spain, and Persia where we get the muscated raisins.

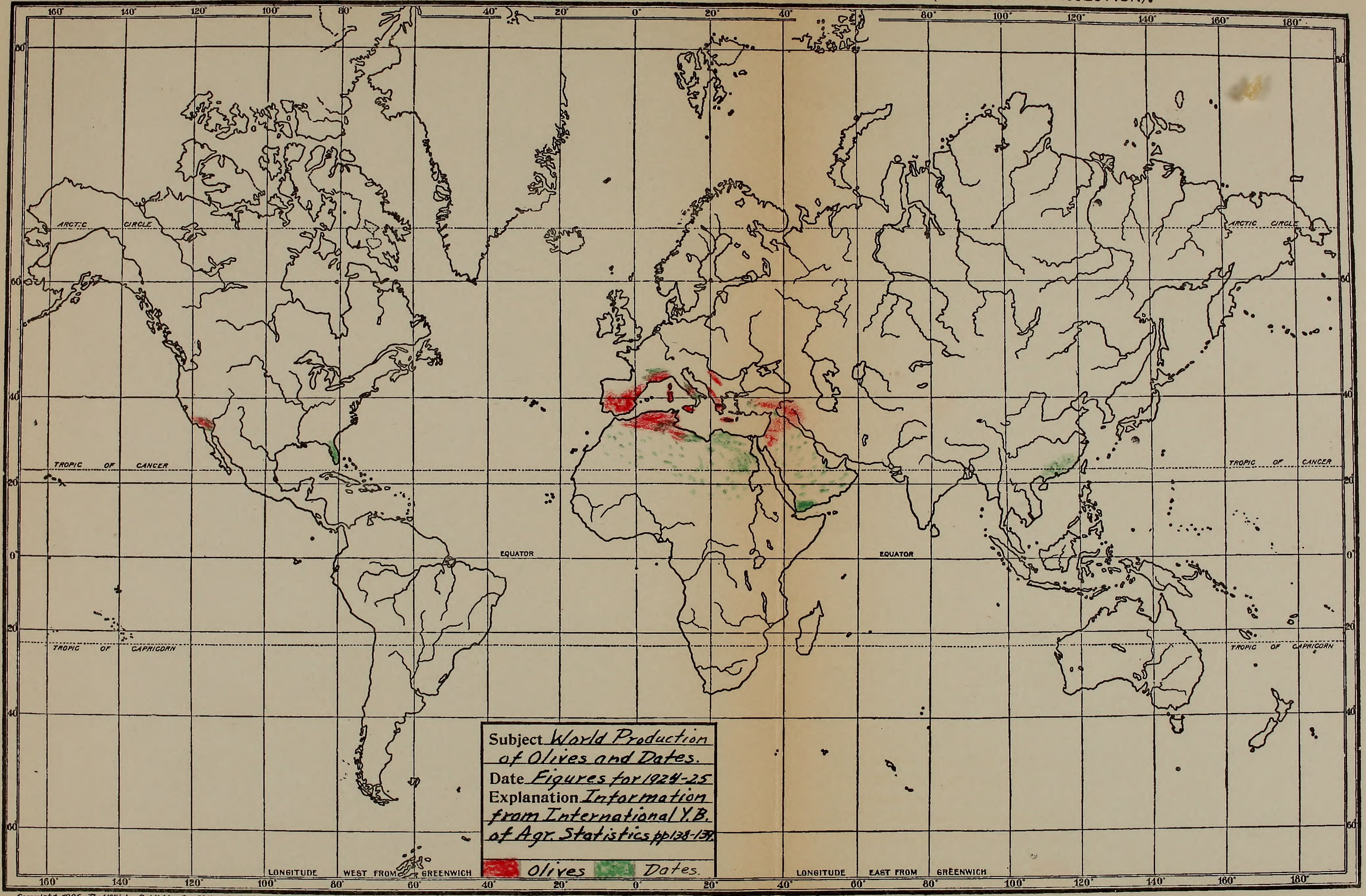
The grape industry was threatened years ago by the phylloxera, and the powdery mildew, but since the introduction of insecticides and fungicides, there is little danger from this source. By means of proper advertizing, such as the California Raisin Growers' Campaign, and those of various wine growers in Europe, the grape industry is bound to be one of the prominent fruit industries of the world.

CITROUS FRUITS

Citrous fruits consist of oranges, lemons, limes, and grapefruit. They are grown in sub-tropical countries, especially in Florida and southern California, in the United States; in southern Apain, northern Africa, Sicily, and southern Italy.(1) Italy and California are the largest producers of lemons, and most of the oranges come from the United States and Spain, while Florida is the largest producer of grapefruit.

(1) Geog. of the World's Agriculture, V.C.Finch --Chart of Citrous Fruits.

McKinley's Desk Outline Maps. Double Size. No. 100a. **THE WORLD** (Mercator's Projection).



Subject World Production of Olives and Dates.

Date Figures for 1924-25

Explanation Information from International Y. B. of Agr. Statistics pp138-139.

🟥 Olives 🟩 Dates.

Fig. 32.

OLIVES

The olive is a small-growing evergreen tree, grown in the Mediterranean countries of Europe, Asia Minor, California, Australia, and other parts of the world. The tree is very slow-growing, and grows to a great age, cultivated chiefly for olive-oil, rather than for fruit. From ninety-five to ninety-eight percent of the total olive crop is used for olive-oil, which is pressed from the pulp of ripe olives.(1) The fruit for trade is chiefly the green olive rather than the ripe one, as this has not the developed demand of the former. Olive oil is rich in food value, and is often used to replace butter and other fats for cooking, as well as medicinal purposes. It forms the butter of the Mediterranean peoples, and constitutes an important part of their diet.

While Spain and Italy are the leading producing countries, the Spanish olive oil is inferior to that of the Italian oil. Though much of this is exported, the Mediterranean countries use more than they export.

APPLES

Apples are one of the popular fruits of the north temperate zone. They surpass in production all other tree-fruits of this region, such as pears, peaches, plums, etc. They are very popular in the United States and Canada, and are grown in all countries of northern Europe, being especially important

(1) Ind. Geog. , p-415.

in England and Germany. They appear from mid-summer on through the fall, the many varieties meet the most discriminating tastes, and some varieties can be stored very successfully through the winter to the following spring.

Apples are grown in many local sections where the conditions of their cultivation are particularly favorable, and in the United States there are a few prominent sections, such as southern Maine, Eastern Massachusetts, western New York, southern Michigan, the Ozark region of Missouri, and parts of the states of Washington, and Oregon. We ship thousands of barrels of apples to Europe where they bring a good price in foreign markets. It is certain that this important fruit will be one of the most prominent throughout history.

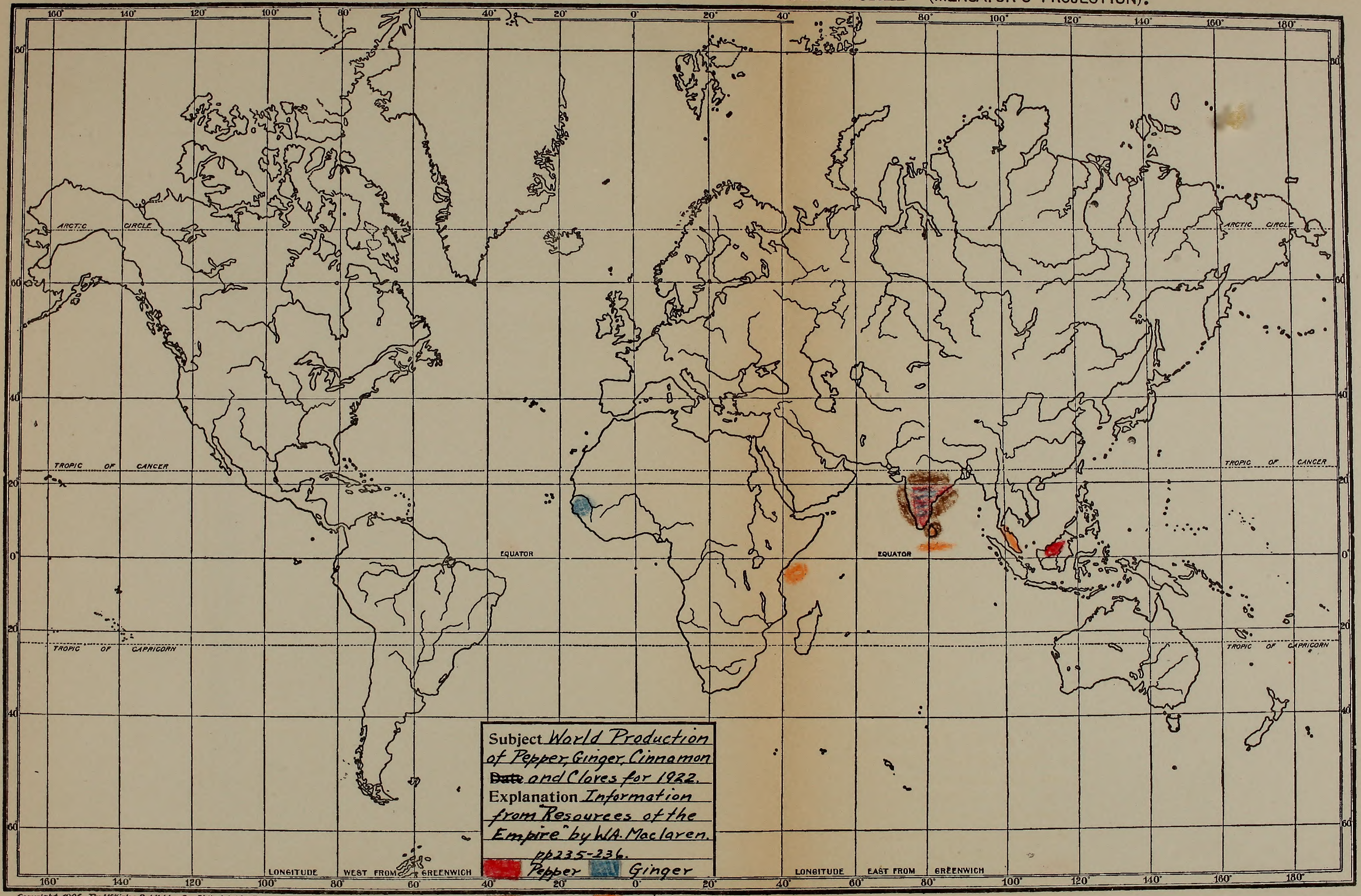
DATES

Dates are a tropical product grown only where there is a light rainfall, and intense summer heat. It is a principal food of a large portion of the inhabitants of northern Africa, as well as of the dogs, horses, and camels. Dates are also raised in western Asia, and southern Europe, as well as in southern California. Despite the desirability of light rainfall, dates require a considerable quantity of water by irrigation. The oases of the desert provide water in this fashion, as do the orchard trenches in southern California.

Chart V

NAME	NATIVE SOURCE	SOIL	RAINFALL	TEMPERATURE AND HUMIDITY	ZONE	GROWING SEASON	IRRIGATION CROP	LABOR REQUIREMENTS	ENEMIES	AVERAGE YIELD PER ACRE	LEADING COUNTRY IN WORLD PRODUCTION	YIELD OF LEADING COUNTRY	SECOND LEADING COUNTRY OF WORLD PRODUCTION	YIELD OF SECOND LEADING COUNTRY	USES OF CROPS	GENERAL CONSIDERATION
SPICES OR CONDIMENTS																
CLOVES	Native of the Moluccas. (1)	Requires good fertile soil to produce during the fourth year. or fifth year. Red Marl. (2)	50 to above 75 inches. (8)	Mean temperature is 80°F. Must be sheltered from the wind. (3)	Equatorial and Subequatorial Zones	An evergreen tree. (6)	No	Labor is a problem. Natives since freed, are somewhat indifferent. Immigrants do work. (9)	Fungi, one of leaf, the other of root. (10)	3-8 lbs. dried cloves per tree 20 years old. (4) About 500 lbs. per acre. (7)	Zanzibar and Pemba (1922)	186,624,000 pounds cloves 22,491,000 lbs clove stems. Production for Export. Resources of the Empire pp 235-236.	Strait Settlements (Penang)	328,000 - lbs	Spice. Used for oil in tooth paste, soaps perfumes, Eugenol, vanillin. (5)	7/8 of Worlds production in Zanzibar and Pemba.
PEPPER	Native in forests of Travancore and Malabar of Southern India. (1)	Damp lowcountry forest land. (2)	75 or above inches. (3)	Requires moist heat with shade. Thrives up to 1500 ft. above sea level. (4)	Subequatorial and Equatorial Zone. (5)	Perennial climbing shrub. May bear twice a year, then rest. (6)	No.	Cheap hand labor required (9)	Blackberry disease. (10)	2000 - 3000 lbs. per acre. (7)	British India (1922)	106,212,000 pounds. Production for Export. Resources of the Empire pp 235-236	Sarawak	32,586,000 pounds	Condiment	Vine Crop. Black and White pepper from same plant. (8)
GINGER	Native of Southeast Asia. (1)	Rich, well tilled humus or loamy soil. (2)	Above 75 inches.	Requires an equitable hot and moist climate, a shaded situation Thrives up to 3500 ft. in Ceylon. (3)	Subequatorial Zone.	Herbaceous perennial (4)	No	Cheap labor required		2000 - 2500 pounds per acre. Average is 1200 lbs. (5)	British India (1922)	60,586,000 pounds. Production for Export. Resources of the Empire pp 235-236	Sierra Leone	26,605,000 pounds.	Food. Medicinal purposes. Confectionery. (6)	Tuberous underground stems are the ginger of Commerce.
CINNAMON	Native of Ceylon. (1)	Requires good fertile soil, to produce bark the fourth year. (2)	50 inches and above 50 inches	Grows to an altitude of 6000 feet in S. India. Damp warm climate. (3)	Subequatorial Zone.	Small evergreen tree. (6)	No	Much hand labor required. Cheap labor. (8)	Few enemies. A beetle that attacks the leaves; squirrels cattle & goats. (10)	150 lbs. per acre in India. (9)	British India.	No official returns. Production for export. Resources of the Empire pp 235-236	Ceylon (1922)	42,974,000 pounds.	Spice. Oil of bark, leaf and root have medicinal qualities. (7)	The cinnamon of commerce is dried bark. (5)

McKINLEY'S DESK OUTLINE MAPS. DOUBLE SIZE. No. 100a. **THE WORLD** (MERCATOR'S PROJECTION).



Subject *World Production of Pepper, Ginger, Cinnamon* ~~Date~~ *and Cloves for 1922.*

Explanation *Information from "Resources of the Empire" by W.A. Maclaren. pp235-236.*

🟥 *Pepper* 🟦 *Ginger*

🟫 *Cinnamon* 🟧 *Cloves*

Fig. 33.

CLOVES

Two parts of the clove plant are used commercially, the clove stems, and the unopened flower-buds. These come from an evergreen tree, easily raised from seedlings and cultivated in plantation fashion. It is grown chiefly in the Moluccas, Zanzibar, and Pemba, which are the leading producers; also in Penang and Ceylon. The unopened flower-buds of each tree are picked three times a year. The stalks and the buds are picked together, separated, and then dried. Cloves contain a volatile oil, called oil-of-cloves.

PEPPER

There are two kinds of pepper,--black and white. The black pepper consists of the dried ripe fruit of a perennial climbing shrub, which is cultivated in Java, Sumatra, Borneo, India, Siam, the Philippines, and Sarawak.(1) A large part of it comes from Malabar. The jungle is cleared and planted with various "catch" crops, and after their harvesting, the pepper cuttings are set out. Two ot three years later, red berries are formed, picked and dried, and becoming shriveled, turn to black. This is the black pepper of our market.

White pepper is of the same origin, but the berries are picked before ripening, soaked in water, and the outer skin removed.

(1) "World's Commercial Products" -- Freeman & Chandler, p-378.

GINGER

Ginger is now cultivated in many parts of the tropics, especially in India, southern China, South America, West Indies, and west Africa.(1) In planting, rhizones of mature plants having at least one bud, are planted out, and the harvest occurs about ten months later. Then the rhizones are dug, and their roots carefully preserved. Dried ginger is either peeled, or unpeeled, the latter variety being dried in the sun, while the former requires a more detailed process of removing the skin, before it may be dried for use. Preserved ginger is prepared by placing the peeled rhizones in vessels, into which a strong sugar syrup is poured.

CINNAMON

Cinnamon is the bark of young shoots of a small evergreen tree, and is raised chiefly in India, Ceylon, Java, Reunion, West Indies, Brazil, Uganda, etc.(2) It is pruned rather heavily, in order to cause the formation of the long shoots bearing the bark desired. The finest quality of cinnamon is a light yellowish brown in color, smooth, rather pliable, and thin. The fragrance is due to the volatile oil-of-cinnamon found in the bark.

(1)"World's Commercial Products" -- Freeman & Chandler, p-382

(2)"World's Commercial Products" -- Freeman & Chandler, p-378

CONCLUSION

After examining the charts with their complete requirements for the thirty-six agricultural products which are discussed in this paper, supplemented by the written material, a very fair conception of the requirements of these crops can be gained.

The charts give the information pertaining to these crops in a general way, and it must be understood that although a certain condition is not met for the growing of one of these crops in a certain locality, the crop may nevertheless be grown there. Because the conditions are not absolutely identical with the general requirements for the production of the crop, the product will not in general be as satisfactory as when grown under perfect conditions. To illustrate: According to the chart , the ideal soil conditions for wheat are a clay loam with a clay sub-soil, yet here in New England, in the early days, when wheat was needed as a source of food, it was grown on our sandy loam with considerable success. Corn will grow in almost any soil, although the requirements are those that are met in the so-called Corn Belt of the United States --- deep, black soils, where they have an average yield of 42 bushels per acre. Compare this with New Jersey, with a yield of 57 bushels to the acre, in the sandy loam of that state.(1) This shows the entrance of a new factor, other than soil, --- an intensive type of agriculture, as compared with the extensive type. The United States is very fortunate in having the large areas of

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(1) U.S.D.A.Y.B.,1927, p-1138.

highly desirable farm land, which, without serious difficulties, have produced bountifully and long the crops this country leads in. The United States must think in terms of the future when these rich lands will be worn out, the country thickly populated, and the world calling at her door for more food. She must gradually change her extensive methods to intensive methods, as the demand for the commodity makes it necessary.

In the introduction, we spoke much in detail concerning climatic requirements and conditions, the world over. It was observed that there are various causes which bring about certain conditions of precipitation, temperature, and amount of winds, in different sections of the world. Different localities on the earth, on the same degree of latitude, would vary in each one of these three items. It is obvious that the old division of climatic zones learned in our school geographies, which divided the earth into five separate zones, one torrid, two temperate, and two frigid, is antediluvian, as far as the actual climatic conditions are concerned within their boundaries.

In the introduction, also, were explained three types of climatic classification -- those of Huntington, Supan, and Herbertson. Each one of these has endeavored to group like climatic conditions in different parts of the world, especially Huntington and Herbertson. Supan has divided his groups according to continents. If a certain product requires certain temperature, certain rainfall, and comparatively similar soil conditions, any place or places on the earth's surface having these conditions, should be able to grow that crop whose requirements

have been so designated. To illustrate: The wheat conditions of the great plains of the Unites States and Canada are similar to those of the vast Ukrain region of Russia, where great quantities of wheat are grown; as well as to portions of central Europe, growers of wheat in smaller-area units; as well as to the valley of the Nile in Egypt, if one takes into account the irrigation system which the limited rainfall there makes necessary. Rubber, also, illustrates this same fact of world-distribution of production with common requirements. It well be noted in the map of "world production of rubber" that those regions producing rubber are practically all in the equatorial or rainforest belt.

One cannot say that this uniform distribution of agricultural products will follow for each crop mentioned. Other facts enter in which cannot be disregarded. Altitude would completely change the type of crop, and would give it a shorter growing season if higher, and a longer growing season if lower, as has been explained before. Rice is limited, with the exception of the upland varieties, to regions which are easily irrigated. So do dates require a certain amount of water -- not necessarily rainfall. Most crops, however, depend upon precipitation to supply the necessary moisture; so the method of the supply of water to the plant is an important factor for some crops.

Labor conditions are likewise a controlling influence in the production and location of many of our crops. As has already been mentioned, the United States produces a considerable quantity of flax for seed, but produces very little for fibre. The climatic

conditions and the necessary land are here for the growth of flax for fibre, as well as of hemp for fibre, yet each of these crops requires large amounts of cheap hand-labor, and this would be excessively expensive in this country. Machines have not yet been devised to replace the use of hand-labor for these products. Tea is another plant which might be successfully grown here; but the excessive amount of cheap hand-labor required, prohibits the growth of tea in the United States. The pay of laborers in the United States is high, so we are forced to produce those things which machine labor makes possible.

The enemies of crops, also, may be a determining factor as to the location of a particular commodity. The history of coffee cultivation in Ceylon is a typical example. There the conditions for growth were excellent, and it was one of the principal crops of the island, so that in 1880, coffee, valued at three-million pounds-sterling was produced annually. Then a microscopic fungus ruined the plants, and the industry, within a very few years, was reduced to one of minor importance. In 1910, it was worth only about twenty-five thousand pounds.(1) Most of the agricultural crops of the world have serious enemies in the nature of insects, or diseases of some sort, but by the introduction of fungicides and insecticides, resulting from the experiments for the control of these enemies by our scientific agriculturalists, and through the aid of plant pathologists, these enemies are being controlled. Crops which have few or no enemies of importance, such as the soy bean, are bound to come into

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(1) World's Commercial Products, p-176.

prominence in new countries, and will be favored by the farmer at least, because it will mean less labor on his part. It only needs sufficient advertising to stimulate public desire for the use of new commodities, to make them profitable commercially.

The world will little note, nor long remember, what we say here; but with increases population, and the resulting increased demand for agricultural commodities, the careless, wasteful type of farming must come to an end. It must be replaced by the scientific, carefully-planned, and skillfully-organized intensive agriculture that Europe is so successfully developing, and that some countries, seemingly, are woefully neglecting.

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